Title:	**A COMMUNICATION SYSTEM ARCHITECTURE**
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Abstract:	Telephone calls, data and other multimedia information is routed through a hybrid network which includes transfer of information across the internet. A media order entry captures complete user profile information for a user. This profile information is utilized by the system throughout the media experience for routing, billing, monitoring, reporting and other media control functions. Users can manage more aspects of a network than previously possible, and control network activities from a central site.
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Claims:	CLAIMSWhat is claimed is: 1. A method for routing media transmissions on a hybrid network including a directory service, comprising of the steps of: (a) transmitting media information to the hybrid network; (b) receiving the media information to the hybrid network; (c) parsing call information from the media information and querying said directory service based on the call information; (d) receiving the query from the hybrid network at the directory service; and (e) identifying an action based on the call information and the directory service information. 2. The method as recited in claim 1, wherein the call information includes delivery preference information. 3. The method as recited in claim 2, including the step of retrieving stored message information based on the preference information. 4. The method as recited in claim 1, wherein the media information includes support for text, audio, multimedia, video and data. 5. The method as recited in claim 1, wherein the actions based on the call information comprise document delivery. 6. The method as recited in claim 5, wherein the document delivery includes paging, email, faxing and voicemail delivery. 7. The method as recited in claim 1, wherein the actions based on the call information comprise outbound calling. 8. A system for routing media transmissions on a hybrid network, including a directory service, comprising: (a) control software that transmits media information to the hybrid network; (b) control software that receives the media information at the hybrid network; (c) control software that parses call information from the media information and queries a directory service based on the call information; (d) control software that receives the query from the hybrid network at the directory service; and (e) control software that identifies an action based on the call information and information from the directory service. 9. The system as recited in claim 8, wherein the call information includes delivery preference information.

10. The system as recited in claim 9, including control software that retrieves stored message information based on the preference information.

11. The system as recited in claim 8, wherein the stored message information includes support for text, audio, multimedia, video and data.

12. The system as recited in claim 8, wherein actions based on the call information include document delivery.

13. The system as recited in claim 12, wherein the document delivery includes paging, email, faxing and voicemail delivery.

14. The system as recited in claim 8, wherein the actions based on the call information include outbound calling.

15. A computer program embodied on a computerreadable medium for routing media transmissions on a hybrid network, including a directory service, comprising: (a) control software that identifies an action based on the call information and information from the directory service. (b) first software that transmits media information to the hybrid network; (c) second software that receives the media information at the hybrid network; (d) third software that parses call information from the media information and queries a directory service based on the call information; (e) fourth software that receives the query from the hybrid network at the directory service; and (f) fifth software that identifies an action based on the call information and information from the directory service.

16. The computer program embodied on a computerreadable medium as recited in claim 15, wherein the call information includes delivery preference information.

17. The computer program embodied on a computerreadable medium as recited in claim 16, including software that retrieves stored message information based on the preference information.

18. The computer program embodied on a computerreadable medium as recited in claim 15, wherein the stored message information includes support for text, audio, multimedia, video and data.

19. The computer program embodied on a computerreadable medium as recited in claim 15, wherein actions based on the call information include document delivery.

20. The computer program embodied on a computerreadable medium as recited in claim 19, wherein the document delivery includes paging, e mail, faxing and voicemail delivery.

21. The computer program embodied on a computerreadable medium as recited in claim 15, wherein the actions based on the call information include outbound calling.

22. A method for media communication over a hybrid network, comprising the steps of: (a) establishing a multicast communication among two or more consumers via the switched network and the internet for transmitting video, audio and/or data communication in Realtime Transmission Protocol (RTP) format; (b) transmitting the video information from each consumer to all other consumers participating in the communication simultaneously; and (c) transmitting the mixed audio information from all other consumers participating in the communication to each participating consumer such that each participating consumer hears all other participating consumers simultaneously.

23. A method for media communications over a hybrid network as recited in claim 22, further comprising the steps of searching a directory of consumers available to participate in video, audio, and/or data communication at a user interface.

24. A method for media communication over a hybrid network as recited in claim 22, wherein a consumer establishes the communication among two or more consumers by choosing other participating consumers according to their Internet Protocol addresses.

25. A method for communication over a hybrid network as recited in claim 23, wherein a consumer establishes the communication among two or more consumers by choosing other participating consumers from the user interface.

26. A method for media communication over a hybrid network as recited in claim 22, wherein a consumer establishes the communication among two or more consumers by communicating with a human or automated operator or agent.

27. A method for media communication over a hybrid network as recited in claim 22, further comprising the steps of: (a) creating a virtual reality environment in which each consumer participating in the communication is represented by a separate image; and (b) communicating media among the participants by manipulating virtual objects among the representative images.

28. An apparatus for media communication over a hybrid network, comprising: (a) a processor with control software that establishes a multicast communication between a consumer and the internet for transmitting media communication in Realtime Transmission Protocol (RTP) format; (b) a processor with control software that transmits the media communication via the internet to one or more other consumers; (c) a processor with control software that receives media communication via the internet from one or more consumers; and (d) a processor with control software that controls the transmission and reception to obtain designated qualities of service for the media communication.

29. An apparatus for media communication over a hybrid network as recited in claim 28, wherein the media communication comprises a combination of video information, audio information and data.

30. An apparatus for media communication over a hybrid network as recited in claim 29, further comprising a user interface for searching to determine whether the intended recipient of the media communication is available to receive the media communication by searching a directory of available video telephony consumers.

31. An apparatus for media communication over a hybrid network as recited in claim 29, wherein the media communication is transmitted through a human or automated operator or agent.

32. An apparatus for media communication over a hybrid network as recited in claim 29, wherein the transmission and reception are controlled by a resource reservation protocol that reserves network resources along the communication path to obtain designated qualities of service for the media communication.

33. An apparatus for media communication over a hybrid network as recited in claim 29, further comprising: (a) a processor with control software that transmits the media communication through a human or automated Operator or agent if a human or automated agent is available; (b) a storage that stores recorded media information; (c) a processor with control software that transmits the recorded media information from the storage location to the consumer if no human or automated operator or agent is available; and (d) a processor with control software that terminates the recorded media information transmission when a human or automated operator or agent becomes available.

34. A computer program embodied on a computerreadable medium for media communication over a hybrid network, comprising: (a) first software that establishes a multicast communication between a consumer and the internet for transmitting media communication in Realtime Transmission Protocol (RTP) format; (b) second software that transmits the media communication via the internet to one or more other consumers; (c) third software that receives media communication via the internet from one or more other consumers; and (d) fourth software that controls the transmission and reception to obtain designated qualities of service for the media communication.

35. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 34, wherein the media communication comprises a combination of video information, audio information and data.

36. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 34, further comprising a fifth software of a directory of available video telephony consumers wherein a consumer determines whether the intended recipient of the media communication is available to receive the media communication by searching the directory.

37. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 34, wherein the media communication is transmitted through a human or automated operator or agent.

38. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 34, wherein the transmission and reception are controlled by a resource reservation protocol that reserves network resources along the communication path to obtain designated qualities of service for the media communication.

39. A computer program embodied in a computerreadable medium for media communication over a hybrid network are recited in claim 34 further comprising: (a) fifth software that transmits the media communication through a human or automated operator or agent if a human or automated agent is available; (b) sixth software that stores recorded media information in a storage location; (c) seventh software that transmits the recorded media information from the storage location to the consumer if no human or automated Operator or agent is available; and (d) eighth software that terminates the recorded media information transmission when a human or automated Operator or agent becomes available.

40. A method for media communication over a hybrid network, comprising the steps of: (a) establishing a multicast communication among a plurality of users for media communication in a Realtime Transmission Protocol (RTP) format utilizing the hybrid network; (b) transmitting the audio communication from a first user to all other users participating in the communication simultaneously; (c) transmitting the video information

from a fist user participating in the multicast communication to each user such that each participating user hears all other participating users; and (d) storing a billing record based on the user participants and media features utilized for routing the media communication over the hybrid network.

41. A method for media communication over a hybrid network as recited in claim 40, further comprising the step of searching a directory of users available to participate in video, audio, and/or data communication, and reflecting use of the search feature in the billing record.

42. A method for media communication over a hybrid network as recited in claim 40, wherein a user establishes the communication among two or more users by choosing other participating users according to their Internet Protocol addresses.

43. A method for media communication over a hybrid network as recited in claim 41, wherein a user establishes the communication among two or more users by choosing other participating users from the user interface.

44. A method for media communication over a hybrid network as recited in claim 40, wherein a user establishes the communication among a plurality of users by communicating with an operator.

45. A method for media communication over a hybrid network as recited in claim 40, further comprising the steps of: (a) creating a virtual reality environment in which each user participating in the communication is represented by a separate image; and (b) communicating media among the participants by manipulating a virtual object associated with the separate image.

46. A system for media communication over a hybrid network, comprising; (a) control software that established a multicast communication among a plurality of users for media communication in a Realtime Transmission Protocol (RTP) format utilizing the hybrid network; (b) communication software which transmits the audio communication from a first user to all other users participating in the communication simultaneously; (c) communication software which transmits the video information from a first user participating in the multicast communication to each user such that each participating user hears all other participating users; and (d) control software that store a billing record based on the user participants and media features utilized for routing the media communication over the hybrid network.

47. The system as recited in claim 46, further comp[rising a user interface for searching a directory of users available to participate in video, audio, and/or data communication, and reflecting use of the search feature in the billing record.

48. The system as recited in claim 46, wherein a user established the communication among two or more users by choosing other participating users according to their Internet Protocol addresses.

49. The system as recited in claim 47, wherein a user established the communication among two or more users by selecting participating users from the user interface.

50. The system as recited in claim 46, wherein a user establishes the communication among a plurality of users by communicating with an operator. Si.

51. The system as recited in claim 46, further comprising; (a) control software utilized to create a virtual reality environment in which each user participating in the communication is represented by a separate image; and (b) control software utilized to communicate media among the participants by manipulating a virtual object associated with separate image.

52. A computer program embodied on a computerreadable medium for routing media communications over a hybrid network, comprising; (a) first software that establishes a multicast communication among a plurality of users for media communication in a Realtime Transmission Protocol (RTP) format utilizing the hybrid network; (c) second software which transmits the audio communication from a first user to all other users participating in the communication simultaneously; (d) third software which transmits the video information from a first user participating in the multicast communication to each user such that each participating user hears all other participating users; and (e) fourth software that stores a billing record based on the user participants and media features utilized for routing the media communication over the hybrid network.

53. The computer program as recited in claim 52, further comprising a user interface for searching a directory of users available to participate in video, audio, and/or data communication, and reflecting use of the search feature in the billing record.

54. The computer program as recited in claim 52, wherein a user establishes the communication among two or more users by choosing other participating users according to their Internet Protocol addresses.

55. The computer program as recited in claim 53, wherein a user established the communication among two or more users by selecting participating users from the user interface.

56. The computer program as recited in claim 52, wherein a user establishes the communication among a

plurality of users by communicating with an operator.

57. The computer program as recited in claim 52, further comprising: (a) fifth software utilized to create a virtual reality environment in which each user participating in the communication is represented by a separate image; and (b) sixth software utilized to communicate media among the participants by manipulating a virtual object associated with the separate image.

58. A method for connecting a first telephony capable device with a second telephony capable device for media transmissions on a hybrid network including an authenticating mechanism, comprising the steps of: (a) dialing a card access number from the first telephony capable device; (b) determining if the first telephony capable device is authorized to place the desired call by prompting for a card number; (c) receiving a card number entry from the first telephony device; (d) prompting for a phone number (e) receiving a phone number entry from the first telephony device; (f) identifying the destination for the call by accessing the directory service and translating the phone number entry into a destination number; and (g) completing the call to the destination number of the second telephony capable device.

59. The method as recited in claim 58, wherein the card information, includes an unique card number.

60. The method as recited in claim 59, wherein the card information, includes an access number.

61. The method as recited in claim 58, wherein the calling card is a debit card.

62. The method as recited in claim 58, wherein the calling card includes access to operator information.

63. The method as recited in claim 58, wherein the calling card includes speeddial features.

64. The method as recited in claim 58, wherein the calling card provides access to conference call support.

65. The method as recited in claim 58, wherein the calling card provides access to voicemail.

66. The method as recited in claim 58, wherein the calling card provides access to electronic mail.

67. The method as recited in claim 58, wherein the calling card provides access to a news service.

68. A computer program embodied on a computerreadable medium for routing media transmissions on a hybrid network from a first telephony capable device to a second telephony capable device, comprising: (a) first software that dials a card access number from the first telephony capable device; (b) second software that determines if the first telephony capable device is authorized to place the desired call by prompting for a card number; (c) third software that receives a card number entry from the first telephony device; (d) fourth software that prompts for a phone number; (e) fifth software that receives a phone number entry from the first telephony device; (f) sixth software that identifies the destination for the call by accessing the directory service and translating the phone number entry into a destination number; and (g) seventh software that completes the call to the destination number of a second telephony capable device.

69. The computer program as recited in claim 68, wherein the card information, includes an unique card number.

70. The computer program as recited in claim 68, wherein the card information, includes an access number.

71. The computer program as recited in claim 68, wherein the calling card is a debit card.

72. The computer program as recited in claim 68, wherein the calling card includes access to operator information.

73. The computer program as recited in claim 68, wherein the calling card includes speeddial features.

74. The computer program as recited in claim 68, wherein the calling card provides access to conference call support.

75. The computer program as recited in claim 66, wherein the calling card provides access to voicemail.

76. The computer program as recited in claim 68, wherein the calling card provides access to electronic mail.

77. The computer program as recited in claim 68, wherein the calling card provides access to a news service.

78. A method for media communication over a hybrid network, comprising the steps of: (a) creating profile information pertaining to a caller; and (b) utilizing the profile information to provide media features over the hybrid network based on the profile information pertaining to the caller.

79. A method for media communication over a hybrid network as recited in claim 78, wherein the profile information is stored in a database accessible from the hybrid network.

80. A method for media communication over a hybrid network as recited in claim 78, wherein the profile information is stored in a distributed database that facilitates high availability processing.

81. A method for media communication over a hybrid network as recited in claim 78, wherein the profile information is stored in a database located in a host processor attached to the switch network.

82. A method for media communication over a hybrid network as recited in claim 78, wherein the profile information is created in a data base located in a host processor when a new user is processed.

83. A method for media communication over a hybrid network as recited in claim 78, wherein the profile information is dynamically alterable by the user associated with the profile information to reflect current information.

84. An apparatus for media communication over a hybrid network coupled with an internet, comprising: (a) a storage attached to the hybrid network in which profile information pertaining to a user is stored; and (b) a processor with control software that utilizes the profile information to provide features over the hybrid network based on the profile information pertaining to the user.

85. An apparatus for media communication over a hybrid network as recited in claim 84, wherein the profile information is stored in a database accessible from the hybrid network.

86. An apparatus for media communication over a hybrid network as recited in claim 84, wherein the profile information is stored in a database that facilitates high availability processing.

87. An apparatus for media communication over a hybrid network as recited in claim 84, wherein the profile information is stored in a database located in a host processor attached to the hybrid network.

88. An apparatus for media communication over a hybrid network as recited in claim 84, wherein the profile information is stored in a database located in host processor when a new customer is processed.

89. An apparatus for media communication over a hybrid network as recited in claim 84, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

90. A computer program embodied on a computerreadable medium for media communication over a hybrid network coupled with an internet, comprising: (a) first software that stores profile information pertaining to a user; (b) second software that utilizes the profile information to provide features over the hybrid network based on the profile information pertaining to the user.

91. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 90, wherein the profile information is stored in a database accessible from the hybrid network.

92. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 90, wherein the profile information is stored in a distributed database that facilitates high availability processing.

93. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 90, wherein the profile information is stored in a database located in a host processor attached to the hybrid network.

94. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 90, wherein the profile information is created in a database located in host processor when a new customer is processed.

95. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 90, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

96. A method for media communication over a hybrid network, comprising the steps of: (a) creating profile information pertaining to a caller; and (b) utilizing the profile information to provide finemefollowme processing over the hybrid network based on the profile information pertaining to the caller.

97. A method for media communication over a hybrid network as recited in claim 96, wherein the profile information is stored in a database accessible from the hybrid network.

98. A method for media communication over a hybrid network as recited in claim 96, wherein the profile information is stored in a distributed database that facilitates high availability processing.

99. A method for media communication over a hybrid network as recited in claim 96, wherein the profile information is stored in a database located in a host processor attached to the switch network.

100. A method for media communication over a hybrid network as recited in claim 96, wherein the profile information is created in a database located in a host processor when a new user is processed.

101. A method for media communication over a hybrid network as recited in claim 96, wherein the profile information is dynamically alterable by the user associated with the profile information to reflect current information.

102. An apparatus for media communication over a hybrid network, comprising: (a) a storage attached to the hybrid network in which profile information pertaining to a user is stored; and (b) a processor with control software that utilizes the profile information to provide findmefollowme processing over the hybrid network based on the profile information pertaining to the user.

103. An apparatus for media communication over a hybrid network as recited in claim 102, wherein the profile information is stored in a database accessible from the hybrid network.

104. An apparatus for media communications over a hybrid network as recited in claim 102, wherein the profile information is stored in a distributed database that facilitates high availability processing.

105. An apparatus for media communications over a hybrid network as recited in claim 102, wherein the profile information is stored in a database located in a host processor attached to the hybrid network.

106. An apparatus for media communications over a hybrid network as recited in claim 102, wherein the profile information is created in a database located in host processor when a new customer is processed.

107. An apparatus for media communications over a hybrid network as recited in claim 102, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

108. A computer program embodied on a computerreadable medium for media communication over a hybrid network, comprising: (a) first software that stores profile information pertaining to a user' (b) second software that utilizes the profile information to provide find mefollowme processing over the hybrid network based on the profile information pertaining to the user.

109. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 108, wherein the profile information is stored in a database accessible from the hybrid network.

110. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 108, wherein the profile information is stored in a distributed database that facilitates high availability processing.

111. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 108, wherein the profile information is stored in a database located in a host processor attached to the switch network.

112. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 108, wherein the profile information is created in a database located in host processor when a new customer is processed.

113. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 108, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

114. A method for media communication over a hybrid network, comprising the steps of: (a) creating profile information pertaining to a caller; and (b) utilizing the profile information to restrict features over the hybrid network based on the profile information pertaining to the caller.

115. A method for media communication over a hybrid network as recited in claim 114, wherein the profile information is stored in a database accessible from the hybrid network.

116. A method for media communication over a hybrid network as recited in claim 114, wherein the profile information is stored in a distributed database that facilitates high availability processing.

117. A method for media communication over a hybrid network as recited in claim 114, wherein the profile information is stored in a database located in a host processor attached to the switched network.

118. A method for media communication over a hybrid network as recited in claim 114, wherein the profile information is created in a database located in a host processor when a new user is processed.

119. A method for media communication over a hybrid network as recited in claim 114, wherein the profile information is dynamically alterable by the user associated with the profile information to reflect current

information.

120. An apparatus for media communication over a hybrid network coupled with an internet, comprising: (a) a storage attached to the hybrid network in which profile information pertaining to a user is stored; and (b) a processor with control software that utilizes the profile information to restrict features over a the hybrid network based on the profile information pertaining to the user.

121. An apparatus for media communication over a hybrid network as recited in claim 120, wherein the profile information is stored in a database accessible from the hybrid network.

122. An apparatus for media communication over a hybrid network as recited in claim 120, wherein the profile information is stored in a distributed database that facilitates high availability processing.

123. An apparatus for media communication over a hybrid network as recited in claim 120, wherein the profile information is stored in a database located in a host processor attached to the hybrid network.

124. An apparatus for media communication over a hybrid network as recited in claim 120, wherein the profile information is created in a database located in a host processor when a new customer is processed.

125. An apparatus for media communication over a hybrid network as recited in claim 120, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

126. A computer program embodied on a computerreadable medium for media communication over a hybrid network coupled to an internet, comprising: (a) first software that stores profile information pertaining to a user; (b) second software that utilizes the profile information to restrict features over the hybrid network based on the profile information pertaining to the user.

127. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 126, wherein the profile information is stored in a database accessible from the hybrid network.

128. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 126, wherein the profile information is stored in a distributed database that facilitates high availability processing.

129. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 126, wherein the profile information is a database located in a host processor attached to the switch network.

130. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 126, wherein the profile information is created in a database located in host processor when a customer is processed.

131. 13 1.

132. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 126, wherein the profile information is dynamically alterable by the client associated with the profile information to reflect current information.

133. A method for facsimile communication over a hybrid network, including a source and a destination facsimile gateway comprising a hybrid network interface, comprising the steps of: (a) establishing a V.29 modem session with a source facsimile gateway; (b) establishing a T.30 facsimile protocol session with a source facsimile gateway; (c) establishing a packet T.30 protocol session with a destination facsimile gateway; (d) contacting a destination facsimile capable device from the destination facsimile gateway; (e) establishing a V.29 modem session with the destination facsimile capable device by the destination facsimile gateway; (f) establishing a T.30 facsimile protocol session with a destination facsimile capable device; (g) negotiating T.30 facsimile parameters from endtoend between two facsimile capable devices via source and destination facsimile gateway; (h) transmitting facsimile from endtoend between two facsimile capable devices by receiving a scanline of data, creating a packet and transmitting the packet to the destination facsimile capable device; and (i) detecting completion of facsimile and relinquishing the communication path.

134. The method as recited in claim 132, wherein call information for determining routing is provided when the facsimile is originated.

135. The method as recited in claim 133, wherein the call information, comprises a called party's number.

136. The method as recited in claim 133, wherein the call information, comprises a calling party number.

137. The method as recited in claim 133, wherein the call information, comprises a carrier identification.

138. The method as recited in claim 133, wherein the call information comprises an originating line.

139. A computer program embodied on a computerreadable medium for facsimile communication over a hybrid network including a source and a destination facsimile gateway comprising a hybrid network interface, comprising: (a) first software that establishes a V.29 modem session with a source facsimile gateway; (b) second software that establishes a T.30 facsimile protocol session with a source facsimile gateway; (c) third software that establishes a packet T.30 protocol session with a destination facsimile gateway; (d) fourth software that contacts a destination facsimile capable device from the destination facsimile gateway; (e) fifth software that establishes a V.29 modem session with the destination facsimile capable device by the destination facsimile gateway; (ll sixth software that establishes a T.30 facsimile protocol session with a destination facsimile capable device; (g) seventh software that negotiates a T.30 facsimile parameters from endtoend between two facsimile capable devices via source and destination facsimile gateway; (h) eighth software that transmits facsimile from endtoend between two facsimile capable devices by receiving a scanline of data, creating a packet and transmitting the packet to the destination facsimile capable device; and (i) ninth software that detects completion of facsimile and relinquishing the communication path.

140. The computer program as recited in claim 138, wherein call information for determining routing is provided when the facsimile is originated.

141. The computer program as recited in claim 139, wherein the call information comprises a called party's number.

142. The computer program as recited in claim 139, wherein the call information comprises a calling party number.

143. The computer program as recited in claim 139, wherein the call information comprises a carrier identification.

144. The computer program as recited in claim 139, wherein the call information comprises an originating line.

145. A hybrid telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a call router coupled to the switched communications network and the packet transmission network; (d) a memory coupled to the call router and having stored therein a call parameter database; the call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the intelligent service platform including a plurality of service engines each configured to execute desired service logic, and a service select component coupled to the service engines to select a service instance running on one of the service engines to process transactions offered by the networks comprising the hybrid telecommunications system.

146. The hybrid telecommunications system of claim 144 in which the service logic identifies at least some of what service features are used, the order in which the service features are invoked, source of input service data, destination for output service data, error values and error handling, invocation of other services, and interaction with other services.

147. The hybrid telecommunications system of claim 145 in which the service features include at least one of timebased routing, authentication and automatic user interaction.

148. A method for directing calls and selecting services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database in a memory; (b) receiving a call on the system; (c) accessing the call parameter database to determine at least one call parameter; (d) routing the call over the switched communications network and the packet transmission network based on at least one call parameter; (e) providing a plurality of service engines each configured to execute desired service logic; and (f) selecting a service instance running on one of the service engines to process transactions offered by the networks comprising the hybrid telecommunications system.

149. The method of claim 147 in which the service logic identifies at least some of what service features are used, the order in which the service features are invoked, source of input service data, destination for output service data, error values and error handling, invocation of other services, and interaction with other services.

150. The method of claim 148 in which the service features include at least one of timebased routing, authentication and automatic user interaction.

151. A computer program embodied on a computerreadable medium for directing calls and managing resources in a hybrid telecommunications system including a switched communications network and a

packet transmission network, which comprises: (a) first software that stores a call parameter database in a memory; (b) second software that accesses the call parameter database when the system receives a call to determine at least one call parameter; (c) third software that routes the call over the switched communications network and the packet transmission network based on the at least one call parameter and the system configuration; and (d) fourth software that provides a plurality of service engines each configured to execute desired service logic; and (e) fifth software that selects a service instance running on one of the service engines to process transactions offered by the networks comprising the hybrid telecommunications system.

152. The computer program embodied on a computerreadable medium as recited in claim 150 in which the service logic identifies at least some of what service features are used, the order in which the service features are invoked, source of input service data, destination for output service data, error values and error handling, invocation of other services, and interaction with other services.

153. The computer program embodied on a computerreadable medium as recited in claim 151 in which the service features include at least one of timebased routing, authentication and automatic user interaction.

154. A hybrid network, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a call router coupled to the switched communications network and the packet transmission network; (d) a memory coupled to the call router and having stored therein a call parameter database; the call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the intelligent service platform including a plurality of media clients; (e) a media server coupled between the plurality of media clients and the memory, the media server having resident thereon logic that couples a first and a second of the media clients in a collaborative session; and (f) the media server including logic that manages the dynamic adjustment of video, audio, voice and other media based on a media clients capabilities to handle various forms of media,.

155. The hybrid network of claim 153 in which the intelligent service platform is configured to use the call parameter database to provide data for a plurality of services.

156. 154 The hybrid network of claim 153 in which the intelligent service platform includes a service engine and the data client is configured to cache data obtained from the call parameter database through the data server for customers serviced by the service engine.

157. The hybrid network of claim 153 in which the media server includes a service engine that determines how to route media through the hybrid network between the first media client and the second.

158. The hybrid network of claim 153 in which all of the plurality of media clients exchange media over the hybrid network.

159. A method for directing calls and providing services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database in a memory; (b) receiving a call on the system; (c) accessing the call parameter database to determine at least one call parameter; (d) routing the call over the switched communications network and the packet transmission network based on at least one call parameter; (e) coupling a media server between a plurality of media clients and the memory, the media server having resident thereon logic that couples a first and a second of the media clients in a collaborative session; and adjusting media output based on a media clients capabilities to handle various forms of media.

160. The method of claim 157 in which the call parameter database is used to provide data for a plurality of services during the call.

161. The method of claim 157 additionally comprising: (g) caching data from the call parameter database for routing the call and providing the service during the call.

162. The method of claim 157 in which the media server includes a service engine that determines how to route media through the hybrid network between the first media client and the second.

163. The method of claim 157 in which all of the plurality of media clients exchange media over the hybrid network.

164. A computer program embodied on a computerreadable medium for directing calls and providing services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) first software that stores a call parameter database in a memory; (b) second software that accesses the call parameter database when the system receives a call to determine at least one call parameter; (c) third software that routes the call over the switched communications network and the packet transmission network based on the at least one call parameter; (d) fourth software that uses the call parameter database to provide data for a service that is provided during

the call; and (e) fifth software that couples a media server between a plurality of media clients and the memory, the media server having resident thereon logic that couples a first and a second of the media clients in a collaborative session; and (f) sixth software that adjusts media output based on a media clients capabilities to handle various forms of media.

165. The computer program embodied on a computerreadable medium of claim 162 in which the fourth software uses the call parameter database to provide data for a plurality of services during the call.

166. The computer program embodied on a computerreadable medium of claim 162 additionally comprising: (g) seventh software that caches data from the call parameter database for routing the call and providing the service during the call.

167. The computer program of claim 162 in which the media server includes a service engine that determines how to route media through the hybrid network between the first media client and the second.

168. The computer program of claim 162 in which all of the plurality of media clients exchange media over the hybrid network.

169. A telecommunications system, which comprises: (a) a switched telephone network; (b) a packet transmission network coupled to the switched telephone network; (c) a call router coupled to the switched telephone network and the packet transmission network; and (d) a memory coupled to the call router and having stored therein a call parameter database; the call router being configured to route a telephone call over the switched telephone network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the intelligent service platform having a central domain including a master database server configured to control and protect integrity of the database and at least one satellite domain including a database client configured to provide user access and update capabilities and being coupled to the master database server.

170. The telecommunications system of claim 167 in which at least one of the master database server and the database client are partitioned into physical subsets, so that not all data items are at one site, while maintaining a logical view of a single database.

171. The telecommunications system of claim 167 in which the database server and the database client are further configured so that the database client can subscribe to data stored in the master database.

172. A method for directing calls in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database in a memory; (b) receiving a call on the system; (c) accessing the call parameter database to determine at least one call parameter; (d) routing the call over the switched communications network and the packet transmission network based on at least one call parameter; (e) providing a central domain including a master database server configured to control and protect integrity of the database; and (f) providing at least one satellite domain including a database client configured to provide user access and update capabilities and being coupled to the master database server.

173. The method of claim 170 additionally comprising: (g) partitioning at least one of the master database server and the database client into physical subsets, so that not all data items are at one site, while maintaining a logical view of a single database.

174. The method of claim 170 additionally comprising: (g) using the database client to subscribe to data stored in the master database.

175. A computer program embodied on a computerreadable medium for directing calls and managing resources in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) first software that stores a call parameter database in a memory; (b) second software that accesses the call parameter database when the system receives a call to determine at least one call parameter; (c) third software that routes the call over the switched communications network and the packet transmission network based on the at least one call parameter and the system configuration; and (d) fourth software that provides a central domain including a master database server configured to control and protect integrity of the database; and (e) fifth software that provides at least one satellite domain including a database client configured to provide user access and update capabilities and being coupled to the master database server.

176. The computer program embodied on a computerreadable medium of claim 173 additionally comprising: (f) sixth software that partitions at least one of the master database server and the database client into physical subsets, so that not all data items are at one site, while maintaining a logical view of a single database.

177. The computer program embodied on a computerreadable medium of claim 173 additionally comprising: (f) sixth software that uses the database client to subscribe to data stored in the master

database.

178. A telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a call router coupled to the switched communications network and the packet transmission network; and (d) a memory coupled to the call router and having stored therein a call parameter database; the call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the call parameter database further comprising a common information base, the intelligent service platform having at least one service engine and a database client coupled between the at least one service engine and the call parameter database to obtain configuration data for customers supported by the at least one service engine.

179. The telecommunications system of claim 178 in which the at least one service engine is configured to allow data to be cached at the service engine.

180. The telecommunications system of claim 178 in which the at least one service engine is configured to handoff control to another service engine during execution of a service for a customer supported by the at least one service engine.

181. A method for directing calls and selecting services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database comprising a common information base in a memory; (b) receiving a call on the system; (c) accessing the call parameter database to determine at least one call parameter; (d) routing the call over the switched communications network and the packet transmission network based on at least one call parameter; (e) providing at least one service engine; and (f) obtaining configuration data for customers supported by the at least one service engine from the call parameter database.

182. The method of claim 179 in which data is cached at the service engine.

183. The method of claim 179 in which the at least one service engine handsoff control to another service engine during execution of a service for a customer supported by the at least one service engine.

184. A computer program embodied on a computerreadable medium for directing calls and managing resources in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) first software that stores a call parameter database in a memory; (b) second software that accesses the call parameter database when the system receives a call to determine at least one call parameter; (c) third software that routes the call over the switched communications network and the packet transmission network based on the at least one call parameter and the system configuration; and (d) fourth software that provides at least one service engine; and (e) fifth software that obtains configuration data for customers supported by the at least one service engine from the call parameter database.

185. The computer program embodied on a computerreadable medium of claim 182 in which data is cached at the service engine.

186. The computer program embodied on a computerreadable medium of claim 182 in which the at least one service engine handsoff control to another service engine during execution of a service for a customer supported by the at least one service engine.

187. A method for routing media transmissions on a hybrid network including a directory service, comprising the steps of: (a) transmitting media information to the hybrid network; (b) receiving the media information at the hybrid network; (c) parsing call information form the media information and querying a directory service based on the call information; and (d) receiving the query form the hybrid network at the directory service; and (e) performing a page based on the call information and the directory service information.

188. The method as recited in claim 185, wherein the call information includes delivery preference information.

189. The method as recited in claim 185, including the step of retrieving stored message information based on the preference information.

190. The method as recited in claim 185, wherein the stored message information includes support for text, audio, multimedia, video and data.

191. The method as recited in claim 185, wherein the actions based on the call information comprise document delivery.

192. The method as recited in claim 189, wherein the document delivery includes the step of creating a billing record based on the actions.

193. The method as recited in claim 185, wherein the actions based on the call information comprise outbound calling.

194. A system for routing media transmissions on a hybrid network, including a directory service, comprising: (a) control software that transmits media information to the hybrid network; (b) control software that receives the media information at the hybrid network; (c) control software that parses call information form the media information and queries a directory service based on the call information; (d) control software that receives the query from the hybrid network at the directory service; and (e) control software that performs a page based on the call information and the directory service information.

195. The system as recited in claim 192, wherein the call information includes delivery preference information.

196. The system as recited in claim 192 including control software that retrieves stored message information based on the preference information.

197. The system as recited in claim 192, wherein the stored message information includes support for text, audio, multimedia, video and data.

198. The system as recited in claim 192, wherein actions based on the call information include document delivery.

199. The system as recited in claim 196, wherein the document delivery includes creation of a billing record based on the actions.

200. The system as recited in claim 192, wherein the actions based on the call information include outbound calling.

201. A computer program embodied on a computerreadable medium for routing media transmissions on a hybrid network, including a directory service, comprising: (a) first software that transmits media information to the hybrid network, (b) second software that receives the media information a the hybrid network; (c) third software that parses call information from the media information and quenes a directory service based on the call information; (d) fourth software that receives the query form the hybrid network at the directory service; and (e) fifth software that performs a page based on the call information and information form the directory service.

202. The computer program embodied on a computerreadable medium as recited in claim 199, wherein the call information includes delivery preference information.

203. The computer program embodied on a computerreadable medium as recited in claim 198, including software that retrieves stored message information based on the preference information.

204. The computer program embodied on a computerreadable medium as recited in claim 199, wherein the stored message information includes support for text, audio, multimedia, video and data.

205. The computer program embodied on a computerreadable medium as recited in claim 199, wherein actions based on the call information include document delivery.

206. The computer program embodied on a computerreadable medium as recited in claim 203, wherein the document delivery includes the creation of a billing record based on the actions.

207. The computer program embodied on a computerreadable medium as recited in claim 199, wherein the actions based on the call information include outbound calling.

208. A method for connecting a first telephony capable device with a second telephony capable device for media transmissions on a hybrid network, comprising the steps of: (a) dialing a collect service from the first telephony capable device; (b) responding to a prompt from the collect service and entering a destination phone number; (c) responding to a prompt from the collect service and entering a caller name; (d) placing a call to the destination phone number by the collect service; and (e) connecting the call to the second telephony capable device in response to a query for acceptance of charges.

209. The method as recited in claim 208, wherein a negative response to any prompt from the calling service results in termination of the call.

210. The method as recited in claim 207, wherein the destination phone number is translated into an internet protocol address utilizing a directory service.

211. The method as recited in claim 208, wherein the collect service is automated utilizing an audio response unit.

212. The method as recited in claim 208, wherein the collect service is completely or partially automated

utilizing a video response unit.

213. The method as recited in claim 206, wherein the collect service is performed manually by an operator.

214. 2 12.

215. The method as recited in claim 206, wherein the collect service is automated through the use of a multimedia response unit.

216. The method as recited in claim 206, wherein the collect service provides access to an internet.

217. The method as recited in claim 206, wherein the collect service bills a third party for services.

218. A computer program embodied on a computerreadable medium for connecting a first telephony capable device with a second telephony capable device for media transmissions on a hybrid network, comprising: (a) first software that dials a collect service from the first telephony capable device; (b) second software that responds to a prompt from the collect service and entering a destination phone number; (c) third software that responds to a prompt from the collect service and entering a caller name; (d) fourth software that places a call to the destination phone number by the collect service; and (e) fifth software that connects the call to the second telephony capable device in response to a query for acceptance of charges.

219. The program as recited in claim 215, wherein a negative response to any prompt from the calling service results in termination of the call.

220. The program as recited in claim 215, wherein the destination phone number is translated into an internet protocol address utilizing a directory service.

221. The program as recited in claim 215, wherein the collect service is automated utilizing an audio response unit.

222. The program as recited in claim 215, wherein the collect service is completely or partially automated utilizing a video response unit.

223. The program as recited in claim 215, wherein the collect service is performed manually by an operator.

224. The program as recited in claim 215, wherein the collect service is automated through the use of a multimedia response unit.

225. The program as recited in claim 215, wherein the collect service provides access to an internet.

226. The program as recited in claim 215, wherein the collect service bills a third party for services.

227. A hybrid telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a call router coupled to the switched communications network and the packet transmission network; (d) a memory coupled to the call router and having stored therein a call parameter database comprising profile information pertaining to a subscriber to the hybrid telecommunications system; the call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database; (e) at least one service engine coupled to the call router, the service engine being configured to execute logic defined by the profile information to provide service features customized for the subscriber for whom the profile information pertains.

228. The hybrid telecommunications system of claim 224 in which the at least one service engine includes a service select service engine, the service select engine being configured to choose one or more services of the hybrid telecommunications system to execute.

229. The hybrid telecommunications system of claim 224 in which the at least one service engine includes an analysis service engine, the analysis service engine being configured to perform a defined function based upon at least one of networks statistics or call context information.

230. The hybrid telecommunications system of claim 226 in which the defined function includes at least one of fraud detection or customer traffic statistics.

231. The hybrid telecommunications system of claim 224 in which the at least one service engine includes a special service engine, the special service engine being configured to provide computing resources or lowerlevel functional capabilities for at least one of system service delivery, monitoring or management.

232. The hybrid telecommunications system of claim 224 additionally comprising: (f) specialized resources coupled to the call router and to the at least one service engine and configured to provide networkbased capabilities including at least one of internet to voice conversion, DTMF detection, facsimile recognition or voice recognition.

233. The hybrid telecommunications system of claim 224 additionally comprising: (f) a call context server coupled to the call router and to the at least one service engine, the call context server being configured to accept network event records and service events in real time and to accept queries against data accepted by the call context server.

234. The hybrid telecommunications system of claim 230 additionally comprising: (g) a revenue manager coupled to the call context server; the call context server further being configured to provide combined event information for a call or other network transaction to the revenue manager.

235. The hybrid telecommunications system of claim 224 additionally comprising: (f) a statistics server coupled to the at least one service engine, the statistics server being configured to accept statistics events from the at least one service engine and allow queries against data accepted by the statistics server.

236. The hybrid telecommunications system of claim 232 in which the statistics server is further configured to compile the statistics events for a given interval of time from statistics events for increments of time comprising the interval of time.

237. A method for directing calls and providing services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database comprising profile information pertaining to a subscriber to the hybrid telecommunications system in a memory; (b) receiving a call on the system; (c) accessing the call parameter database to determine at least one call parameter; (d) routing the call over the switched communications network and the packet transmission networks based on the at least one call parameter; and (e) executing logic defined by the profile information to provide service features customized for the subscriber for whom the profile information pertains.

238. The method of claim 234 in which the logic chooses one or more services of the hybrid telecommunications system to execute.

239. The method of claim 234 in which the logic additionally performs a defined function based upon at least one of networks statistics or call context information.

240. The method of claim 236 in which the defined function includes at least one of fraud detection or customer traffic statistics.

241. The method of claim 234 in which the logic additionally provides computing resources or lowerlevel functional capabilities for at least one of system service delivery, monitoring or management.

242. The method of claim 234 additionally comprising: (f) providing a networkbased capability including at least one of Internet to voice conversion, DTMF detection, facsimile recognition or voice recognition.

243. The method of claim 234 additionally comprising: (f) accepting network event records and service events in real time with a call context server; and (g) accepting queries against data accepted by the call context server.

244. The method of claim 240 additionally comprising: (h) providing combined event information for a call or other network transaction from the call context server to a revenue manager.

245. The method of claim 234 additionally comprising: (f) accepting statistics events; and (g) allowing queries against the accepted statistics events.

246. The method of claim 242 additionally comprising compiling the statistics events for a given interval of time from statistics events for increments of time comprising the interval of time.

247. A computer program embodied on a computerreadable medium for directing calls and providing services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) first software that stores a call parameter database comprising profile information pertaining to a subscriber to the hybrid telecommunications system in a memory; (b) second software that accesses the call parameter database when the system receives a call to determine at least one call parameter; (c) third software that routes the call over the switched communications network and the packet transmission network based on the at least one call parameter; and (d) fourth software that executes logic defined by the profile information to provide service features customized for the subscriber for whom the profile information pertains.

248. The computer program embodied on a computerreadable medium of claim 244 in which the logic chooses one or more services of the hybrid telecommunications system to execute.

249. The computer program embodied on a computerreadable medium of claim 2 1 in which the logic additionally performs a defined function based upon at least one of network statistics or call context information.

250. The computer program embodied on a computerreadable medium of claim 246 in which the defined function includes at least one of fraud detection or customer traffic statistics.

251. The computer program embodied on a computerreadable medium of claim 244 in which the logic additionally provides computing resources or lowerlevel functional capabilities for at least one of system service delivery, monitoring or management.

252. The computer program embodied on a computerreadable medium of claim 244 additionally comprising: (f) fifth software that provicles a networkbased capability including at least one of Internet to voice conversion, DTMF detection, facsimile recognition or voice recognition.

253. The computer program embodied on a computerreadable medium of claim 244 additionally comprising: (f) fifth software that accepts network event records and service events in real time with a call context server; and (g) sixth software that accepts queries against data accepted by the call context server.

254. The computer program embodied on a computerreadable medium of claim 250 additionally comprising: (h) seventh software that provides combined event information for a call or other network transaction from the call context server to a revenue manager.

255. The computer program embodied on a computerreadable medium of claim 244 additionally comprising: (f) fifth software that accepts statistics events; and (g) sixth software that allows queries against the accepted statistics events.

256. The computer program embodied on a computerreadable medium of claim 252 additionally comprising: (h) seventh software that compiles the statistics events for a given interval of time from statistics events for increments of time comprising the interval of time.

257. A method for media communication over a hybrid network, comprising the steps of: (a) recording video, audio and/or data communications; (b) transmitting the video, audio and/or data communications over the hybrid network to one or more storage locations associated with one or more designate recipient consumers; (c) storing the video, audio and/or data communications in the storage location(s) associated with the designated recipient consumer(s); and (d) transmitting the video, audio and/or data communications from each storage location over the hybrid network to each designated recipient consumer upon request by each designated recipient consumer.

258. A method for media communication over a hybrid network as recited in claim 254, further comprising the steps of: (a) enabling a consumer to record a greeting communication, including video, audio and/or data information; (b) transmitting the greeting communication over the hybrid network to a storage location associated with the consumer; (c) storing the greeting communication in the storage location associated with the consumer; and (d) transmitting the greeting communication from the storage location over the hybrid network to other consumers who attempt to communicate with the consumer associated with the greeting.

259. A method for communication over a hybrid network as recited in claim 254, wherein a consumer accesses the communications stored in the designated storage location from a user interface system.

260. A method for communication over a hybrid network as recited in claim 254, wherein a consumer accesses the communications stored in the designated storage location with the aid of a human or automated operator or agent.

261. A method for communication over a hybrid network as recited in claim 254, wherein the communication is automatically transmitted to the storage location associated with a designated recipient consumer if the recipient consumer is not available to participate in a live communication.

262. A method for communication over a hybrid network as recited in claim 255, wherein the greeting communication is automatically transmitted to the consumer attempting to communicate with the consumer associated with the greeting if the consumer associated with the greeting is not available to participate in a live communication.

263. A method for media communication over a hybrid network, comprising the steps of: (a) creating data pertaining to the media communication over a hybrid network; (b) storing the data in a distributed database; (c) partitioning data into physical subsets at a plurality of storage sites within a distributed database; and (d) presenting applications accessing or updating data with a logical view of a single, coherent database despite the plurality of storage sites.

264. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises information regarding applications internal to the hybrid network.

265. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises information regarding applications external to the hybrid

network.

266. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises monitoring information regarding the hybrid network.

267. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises information used to control the hybrid network. 26S.

268. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media' communication comprises information regarding changes to the data stored in the database

269. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises information regarding additions to the data stored in the database.

270. A method for media communication over a hybrid network as recited in claim 260, wherein the data pertaining to the media communication comprises information regarding deletions to the data stored in the database.

271. A method for media communication over a hybrid network as recited in claim 260, wherein the step of presenting applications accessing or updating data with a logical view of a single, coherent database comprises the steps of: (a) establishing data locations; (b) allocating storage and memory; (c) loading data stores; and (d) optimizing data access and update paths.

272. An apparatus for media communication over a hybrid network, comprising: (a) a processor with control software that creates data pertaining to the media communication over a hybrid network; (b) a storage attached to the hybrid network in which data pertaining to the hybrid network is stored; (c) control software that partitions data into physical subsets at a plurality of storage sites within a distributed database; and (d) control software that presents applications accessing or updating data with a logical view of a single, coherent database despite the plurality of storage sites.

273. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information regarding applications internal to the hybrid network.

274. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information regarding applications external to the hybrid network.

275. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises monitoring information regarding the hybrid network.

276. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information used to control the hybrid network.

277. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information regarding changes to the data stored in the database.

278. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information regarding additions to the data stored in the database.

279. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the data pertaining to the media communication comprises information regarding deletions to the data stored in the database,.

280. An apparatus for media communication over a hybrid network as recited in claim 269, wherein the control software that presents applications accessing or updating data with a logical view of a single, coherent database despite the plurality of storage sites comprises: (a) control software that establishes data locations; (b) control software that allocates storage and memory; (c) control software that loads data stores; and (d) control software that optimizes data access and update paths.

281. A computer program embodied on a computerreadable medium for media communication over a hybrid network, comprising: (a) first software that creates data pertaining to the media communication over a hybrid network; (b) second software that stores the data in a distributed database; (c) third software that partitions data into physical subsets at a plurality of storage sites within a distributed database; and (d) fourth software that presents applications accessing or updating data with a logical view of a single, coherent database despite the plurality of storage sites.

282. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises information regarding applications internal to the hybrid network.

283. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 19, wherein the data pertaining to the media communication comprises information regarding applications external to the hybrid network.

284. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises monitoring information regarding the hybrid network.

285. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises information used to control the hybrid network.

286. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises information regarding changes to the data stored in the database.

287. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises information regarding additions to the data stored in the database.

288. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the data pertaining to the media communication comprises information regarding deletions to the data stored in the database.

289. A computer program embodied on a computerreadable medium for media communication over a hybrid network as recited in claim 278, wherein the fourth software that presents applications accessing or updating data with a logical view of a single, coherent comprises: (a) fifth software that establishes data locations; (b) sixth software that allocates storage and memory; (c) seventh software that loads data stores; and (d) eighth software that optimizes data access and update paths.

290. A hybrid telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a call router coupled to the switched communications network and the packet transmission network; and (d) a gateway server in communication with the call router, the gateway server being configured to provide file transfer services to a user connected to the switched communications network.

291. The hybrid telecommunications system of claim 287, further comprising an authentication server, wherein the identity of a user is authenticated by the authentication server.

292. The hybrid telecommunications system of claim 287, further comprising an exterior packet filter coupled to the call router, the gateway server being coupled to the exterior packet filter, wherein the exterior packet filter is configured to accept only communications originating from a predetermined set of addresses.

293. The hybrid telecommunications system of claim 287, wherein the gateway server is configured to provide only readonly file transfer services.

294. The hybrid telecommunications system of claim 287, further comprising a production token ring network in communication with the gateway server.

295. The hybrid telecommunications system of claim 291, further comprising an interior packet filter coupled to the production token ring network, the gateway server being coupled to the interior packet filter, wherein the interior packet filter is configured to accept only communications originating from a predetermined set of addresses.

296. A method for directing calls in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) storing a call parameter database in a memory; (b) establishing a system configuration of the hybrid telecommunications system; (c) receiving a call on the system; (d) accessing the call parameter database to determine at least one call parameter; and (e) routing the call over the switched communications network and the packet transmission network to a gateway server based on at least one call parameter.

297. The method of claim 293 further comprising: (f) communicating with an authentication server to authenticate the origin of the call.

298. The method of claim 293 further comprising: (f) selectively filtering communications through an exterior packet filter, said exterior packet filter being configured to accept only communications originating from a predetermined set of addresses.

299. The method of claim 293 wherein the gateway server is configured to provide only readonly file transfer services.

300. A computer program embodied on a computerreadable medium for directing calls and providing services in a hybrid telecommunications system including a switched communications network and a packet transmission network, which comprises: (a) first software that stores a call parameter database in a memory; (b) second software that establishes a system configuration of the hybrid telecommunications system; (c) third software that receives a call on the system; (d) fourth software that accesses the call parameter database when the system receives a call to determine at least one call parameter; and (e) fifth software that routes the call over the switched communications network and the packet transmission network to a gateway server based on at least one call parameter.

301. The computer program embodied on a computerreadable medium of claim 297 further comprising: (f) a sixth software that communicates with an authentication server to authenticate the origin of the call.

302. The computer program embodied on a computerreadable medium of claim 297, further comprising: (f) a sixth software that selectively filters communications through an exterior packet filter, said exterior packet filter being configured to accept only communications originating from a predetermined set of addresses.

303. The computer program embodied on a computerreadable medium of claim 297 in which the gateway server is configured to provide only readonly file transfer services.

304. A hybrid switch for a telecommunications systems, comprising: (a) at least one switched network interface; (b) at least one internet interface; (c) a bus coupling the at least one switched network interface and the at least one internet interface; and (d) a host processor coupled to the bus.

305. The hybrid switch of claim 301 in which at least one of the interfaces is configured to transfer a call processing command received at the at least one of the interfaces to the host processor for selecting one of the at least one interfaces as an outgoing interface for a call received at one of the at least one interfaces and associated with the call processing command.

306. The hybrid switch of claim 302 in which the host processor is further configured to query an internet service control point coupled to the at least one internet interface for routing instructions.

307. The hybrid switch of claim 302 in which the host processor is further configured to derive routing instructions locally.

308. The hybrid switch of claim 301 additionally comprising at least one digital signal processor coupled to the bus.

309. A hybrid telecommunications system, comprising: (a) A hybrid switch of claim 301; (b) At least one switched network coupled to the hybrid switch; and (c) At least one internet coupled to the hybrid switch.

310. The hybrid telecommunications system of claim 306 additionally comprising: (a) at least one echo canceller coupled to the hybrid switch.

311. The hybrid telecommunications system of claim 306 additionally comprising: (a) at least one signal demultiplexer coupled to the hybrid switch.

312. The hybrid telecommunications system of claim 306 in which at least one fiberoptic cable is coupled to the hybrid switch.

313. The hybrid telecommunications system of claim 306 additionally comprising: (a) at least one modem coupled to the hybrid switch.

314. The hybrid telecommunications system of claim 306 additionally comprising: (a) at least one pooled switch matrix coupled to the hybrid switch, the system being configured to establish a connection dynamically through the pooled switched matrix based on a characteristic of a call received at one of the at least one interfaces.

315. The telecommunications system of claim 306 additionally comprising: (a) a plurality of plugandplay modules for coupling communications peripherals in a call.

316. A method for processing a communication at a hybrid switch, comprising the steps of: (a) receiving a call processing command associated with a particular port of a hybrid switch; (b) receiving a communication at the port of the hybrid switch associated with the call processing command; and (c) coupling an appropriate plugandplay module specified in the call processing command to the particular port of the hybrid switch to process the communication.

317. The method of claim 313 additionally comprising the steps of: (a) transferring the call processing command to a host processor for selecting a particular port of the hybrid switch as an outgoing port for a

call associated with the call processing command; and (b) routing the call to the outgoing port.

318. The method of claim 314 additionally comprising the step of: (a) querying an internet service control point coupled to the hybrid switch with the host processor for routing instructions.

319. The method of claim 3 14 in which the host processor derives routing instructions locally.

320. The method of claim 314 in which one of the port receiving the call and the outgoing port is coupled to a switched network and the other of the port receiving the call or the outgoing port.

321. The method of claim 314 in which at least one fiberoptic cable is coupled to the port receiving the call or the outgoing port.

322. The method of claim 313 in which the plugandplay module is a digital signal processor.

323. The method of claim 313 in which the plugandlay module is an echo canceller.

324. The method of claim 313 in which the plugandplay module is a signal demultiplexer.

325. The method of claim 313 in which the plugandplay module is a modem.

326. The method of claim 313 in which the plugandplay module is dynamically coupled to the particular port of the hybrid switch by a pooled switch matrix.

327. A computer program embodied on a computerreadable medium for processing a communication at a hybrid switch, comprising: (a) first software that receives a call processing command associated with a particular port of a hybrid switch; (b) second software that receives a communication at the port of the hybrid switch associated with the call processing command; and (c) third software that couples an appropriate plugandplay module specified in the call processing command to the particular port of the hybrid switch to process the communication.

328. The computer program embodied on a computerreadable medium of claim 324 additionally comprising: (a) fourth software that transfers the call processing command to a host processor for selecting a particular port of the hybrid switch as an outgoing port for a call associated with the call processing command; and (b) fifth software that routes the call to the outgoing port.

329. The computer program embodied on a computerreadable medium of claim 325 additionally comprising: (a) sixth software that queries an internet service control point coupled to the hybrid switch with the host processor for routing instructions.

330. The computer program embodied on a computerreadable medium of claim 325 additionally comprising: (a) sixth software that derives routing instructions locally with the host processor.

331. The computer program embodied on a computerreadable medium of claim 325 in which the first and fifth software are respectively configure to received the call and route the call from and to either a switched network or an internet.

332. The computer program embodied on a computerreadable medium of claim 325 in which the first and fifth software are respectively configured to received the call and route the call from and to a fiber optic cable.

333. The computer program embodied on a computerreadable medium of claim 325 in which the third software is configured to couple a digital signal processor to the particular port.

334. The computer program embodied on a computerreadable medium of claim 325 in which the third software is configured to couple an echo canceller to the particular port.

335. The computer program embodied on a computerreadable medium of claim 325 in which the third software is configured to couple a signal demultiplexer to the particular port.

336. The computer program embodied on a computerreadable medium of claim 325 in which the third software is configured to couple a modem to the particular port.

337. The computer program embodied on a computerreadable medium of claim 325 in which the third software is configured to couple the plug andplay module to the particular port of the hybrid switch dynamically through a pooled switch matrix.

338. A communications system, comprising: (a) one or more switched communications networks; (b) one or more packet transmission networks; (c) a prioritizing access router coupled to the switched communications networks and the packet transmission networks; and (d) a memory coupled to the prioritizing access router and having stored therein a service control parameter database; the prioritizing access router including a plurality of functions, each function configured to route data over the switched communications network and

the packet transmission network based on at least one service control parameter from the service control parameter database, the prioritizing access router further including logic that delivers some data on each network interface earlier than other data, based on at least one service control parameter from the service control parameter database.

338. The communications system of claim 335 wherein the plurality of functions includes the employment of modulation/demodulation (modem) equipment to transmit and receive data over standard telephone lines.

340. The communications system of claim 335 wherein the plurality of functions includes the employment of standard data network interface equipment, including but not limited to 10baseT Ethernet, 100baseT Ethernet, coaxial Ethernet, Gigabit Ethernet, Isochronous Ethernet, Fiber Distributed Data Interface (FDDI), Asynchronous Transfer Mode (ATM), X.25, Frame Relay, and Switched Multimegabit Data Service.

341. The communications system of claim 335 wherein the plurality of functions includes the use conversion function, capable of converting packets utilizing the Point to Point Protocol (PPP) to packets utilizing the Internet Protocol (IP), or vice versa.

342. The communications system of claim 335 wherein the plurality of functions includes the use of packet classifier function, capable of classifying packets in groups according to criteria.

343. The communications system of claim 339 wherein the packet classifier function classifies packets according to destination IP address.

344. 34 1. The communications system of claim 339 wherein the packet classifier function classifies packets according to originating IP address.

345. The communications system of claim 339 wherein the packet classifier function classifies packets according to destination User Datagram Protocol (UDP) port number.

346. The communications system of claim 339 wherein the packet classifier function classifies packets according to originating UDP port number.

347. The communications system of claim 339 wherein the packet classifier function classifies packets according to destination Telnet Control Protocol port number.

348. The communications system of claim 339 wherein the packet classifier function classifies packets according to originating Telnet Control Protocol port number.

349. The communications system of claim 339 wherein the packet classifier function classifies packets according to a flow label.

350. The communications system of claim 339 wherein the packet classifier function classifies packets according to a tag.

351. The communications system of claim 339 wherein the packet classifier function classifies packets according to a data type.

352. The communications system of claim 339 wherein the packet classifier function classifies packets according to originating User ID.

353. The communications system of claim 339 wherein the packet classifier function classifies packets according to destination User ID.

354. 35 1. The communications system of claim 339 wherein the packet classifier function classifies packets according to any defined data field in the packet.

355. The communications system of claim 335 wherein the plurality of functions includes the employment of a packet scheduler.

356. The communications system of claim 352 wherein the packet scheduler is configured to place packets on a priority queue according to packet classification and service control parameters.

357. The communications system of claim 353 wherein the priority queues order packets for transmission on network interfaces.

358. The communications system of claim 353 wherein the priority queues order packets for transmission on modem interfaces.

359. The communications system of claim 335 wherein the plurality of functions includes a controller function.

360. The communications system of claim 356 wherein the controller function accepts control commands

through an application programming interface.

361. The communications system of claim 356 wherein the controller function can accept or reject control commands based upon defined policies.

362. The communications system of claim 356 wherein the controller function can accept or reject control commands based upon resource availability.

363. The communications system of claim 356 wherein the controller function can accept or reject control commands based upon the privileges granted to the requesting entity.

364. A computer program embodied on a computerreadable medium for prioritizing and routing media transmissions on a hybrid network, the hybrid network including one or more switched networks coupled to one or more packet transmission network, comprising: (a) first software that prioritizes access and routing between the switched communications network and the packet transmission networks; and (b) storing a service control parameter database in a memory coupled to the first software including a plurality of functions, each function configured to route data over the switched communications network and the packet transmission network based on at least one service control parameter from the service control parameter database, and logic that delivers some data on each network interface earlier than other data, based on at least one service control parameter from the service control parameter database.

365. A telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a user terminal coupled to the switched communications network or the packet transmission network, or both; (d) one or more call routers coupled to the switched communications network and the packet transmission network; (e) a memory coupled to each call router and having stored therein a call parameter database; each call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the intelligent service platform having a plurality of functions available from a single connection; (f) a gateway which couples the packet transmission network with the switched communications network; (g) a call queue manager coupled to the packet transmission network; (h) an Automated Call Distributor (ACD) coupled to the switched communications network; (i) an ACD Controller coupled to the ACD; and (j) an agent workstation coupled to the switched communications network via the ACD, and coupled to the packet transmission network.

366. The telecommunications system of claim 362 in which the plurality of functions include at least on of user profile management, information service profile management, address translation, admission control, resource management, topology tracking, statistics collection, utilization and billing data logging, message retrieval and message distribution.

367. The telecommunications system of claim 362 in which the user terminal is configured to browse the world wide web.

368. The telecommunications system of claim 362 in which the user terminal is configured with software and hardware permitting the launch of an interactive voice or multimedia conversation.

369. The telecommunications system of claim 365 in which a call router routes the interactive voice or multimedia conversation to a gateway.

370. The telecommunications system of claim 368 in which the gateway launches a corresponding interactive voice or multimedia conversation on the switched communications network.

371. The telecommunications system of claim 367 in which a call router routes the corresponding interactive voice or multimedia conversation to an ACD.

372. The telecommunications system of claim 368 in which the gateway signals information to the ACD, including at least one of the following: identification of the conversation originator, identification of the originating user terminal, identification of the originating gateway, identification of one or more web pages browsed, identification of the intended destination address, identification of the intended destination user, and unique identification of the interactive voice conversation.

373. The telecommunications system of claim 369 in which the ACD delivers the signaling information to the ACD controller.

374. The telecommunications system of claim 370 in which the ACD controller, using any available resources on the packet transmission network or the switched communications network, forms display screens.

375. The telecommunications system of claim 371 in which the ACD controller delivers the display screens to an agent workstation.

376. The telecommunications system of claim 371 in which the ACD controller transfers the interactive voice or multimedia conversation to the agent workstation.

377. The telecommunications system of claim 373 in which the agent workstation permits voice or multimedia interaction with the originating user terminal, via the packet transmission network and the switched communications network.

378. A telecommunications system, which comprises: (a) a switched communications network; (b) a packet transmission network coupled to the switched communications network; (c) a user terminal coupled to the switched communications network or the packet transmission network, or both; (d) one or more call routers coupled to the switched communications network and the packet transmission network; (e) a memory coupled to each call router and having stored therein a call parameter database; each call router being configured to route a call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database, the call router further being configured to provide an intelligent service platform, the intelligent service platform having a plurality of functions available from a single connection; (f) a gateway which couples the packet transmission network with the switched communications network; (g) a call queue manager coupled to the packet transmission network; (h) an Automated Call Distributor (ACD) coupled to the switched communications network; (i) an ACD Controller coupled to the ACD; (j) a Voice Response Unit coupled to the ACD; and (k) an agent workstation coupled to the switched communications network via the ACD, and coupled to the packet transmission network.

379. The telecommunications system of claim 375 in which the plurality of functions include at least on of user profile management, information service profile management, address translation, admission control, resource management, topology tracking, statistics collection, utilization and billing data logging, message retrieval and message distribution.

380. The telecommunications system of claim 375 in which the user terminal is configured to browse the world wide web.

381. The telecommunications system of claim 375 in which the user terminal is configured with software and hardware permitting the launch of an interactive voice or multimedia conversation.

382. The telecommunications system of claim 378 in which a call router routes the interactive voice or multimedia conversation to a gateway.

383. The telecommunications system of claim 379 in which the gateway launches a corresponding interactive voice or multimedia conversation on the switched communications network.

384. The telecommunications system of claim 380 in which a call router routes the corresponding interactive voice or multimedia conversation to an ACD.

385. The telecommunications system of claim 381 in which ACD connects the interactive voice or multimedia conversation to a Voice Response Unit (VRU).

386. The telecommunications system of claim 382 in which the gateway signals information to the VRU, including at least one of the following: identification of the conversation originator, identification of the originating user terminal, identification of the originating gateway, identification of one or more web pages browsed, identification of the intended destination address, identification of the intended destination user, and unique identification of the interactive voice conversation.

387. The telecommunications system of claim 383 in which the VRU delivers the signaling information to the ACD controller.

388. The telecommunications system of claim 384 in which the ACD controller, using any available resources on the packet transmission network or the switched communications network, forms display screens.

389. The telecommunications system of claim 385 in which the ACD controller delivers the display screens to an agent workstation.

390. The telecommunications system of claim 381 in which the ACD controller transfers the interactive voice or multimedia conversation to the agent workstation.

391. The telecommunications system of claim 387 in which the agent workstation permits voice or multimedia interaction with the originating user terminal, via the packet transmission network and the switched communications network.

Description:

A COMMUNICATION SYSTEM ARCHITECTURE Field Of The Invention The present invention relates to the marriage of the Internet with telephony systems, and more specifically, to a system, method and article

of manufacture for using the Internet as the communication backbone of a communication system architecture while maintaining a rich array of call processing features.

The present invention relates to the interconnection of a communication network including telephony capability with the Internet. The Internet has increasingly become the communication network of choice for the user marketplace. Recently, software companies have begun to investigate the transfer of telephone calls across the Internet. However, the system features that users demand of normal call processing are considered essential for call processing on the Internet. Today, those features are not available on the Internet.

SUMMARY OF THE INVENTION According to a broad aspect of a preferred embodiment of the invention, telephone calls, data and other multimedia information is routed through a switched network which includes transfer of information across the Internet utilizing telephony routing information and Internet protocol address information. A telephony order entry procedure captures complete user profile information for a user. This profile information is used by the system throughout the telephony experience for routing, billing, monitoring, reporting and other telephony control functions. Users can manage more aspects of a network than previously possible and control network activities from a central site, while still allowing the operator of the telephone system to maintain quality and routing selection. The profile information provides routing over the hybrid network (switched network and the Internet) for facsimile information. The system includes support for object directed paging with an universal mailbox, and for object filtering.

According to another broad aspect of a preferred embodiment of the invention, telephone calls; data and other multimedia information are routed through a hybrid network which includes

transfer of information across the Internet utilizing telephony routing information and Internet protocol address information. Users can manage more aspects of a network than previously possible and control network activities from a central site, while still allowing the operator of the telephone system to maintain quality and routing selection. The system creates data pertaining to the media communication over a hybrid network and stores the data in a distributed database. The system also partitions data into physical subsets at various locations throughout the distributed database while preserving a logical view of a single, coherent database. The hybrid network including support for processing collect calls.

According to another broad aspect of a preferred embodiment of the invention, telephone calls, data and other multimedia information are routed through a switched network which includes transfer of information across the Internet. A hybrid telecommunications system includes a switched communications network. A packet transmission network is coupled to the switched communications network. A call router is coupled to the switched communications network and the packet transmission network. A gateway server in communication with the call router provides file transfer services to a user connected to the switched communications network. The identity of the user is optionally authenticated by an authentication server.

In a further aspect of a preferred embodiment of the invention, an exterior packet filter is coupled to the call router and the gateway server. The exterior packet filter is configured to accept communications originating from a predetermined set of addresses.

In still another aspect of the invention, the gateway server is configured to provide only read-only file transfer services.

In yet another aspect of the invention, a production token ring network is in communication with the gateway server. The production token ring network is optionally coupled to an interior packet filter configured to accept only communications originating from a predetermined set of addresses.

According to another broad aspect of a preferred embodiment of the invention, telephone calls, data and other multimedia information including audio and video are routed through a switched network which included transfer of information across the Internet. Users can participate in video conference calls in which each participant can simultaneously view the

video from each other participant and hear the mixed audio from all participants. Users can also share data and documents with other video conference participants.

According to another broad aspect of a preferred embodiment of the invention, telephone calls, data and other multimedia information including audio and video are routed through a switched network which includes transfer of information across the Internet. Users can deliver and receive video mail messages, including video, audio and/or data information, to and from any other user capable of delivering and receiving such mail messages. Users can also receive stored video, audio and/or data information on demand from a directory of choices. User can manage more aspects of a network than previously

possible and control network activities from a central site, while still allowing the operation of the telephone system to maintain quality and routing selection.

In another aspect of a preferred embodiment of the invention, a hybrid telecommunications system includes a switched communications network. A packet transmission network is coupled to the switched communications network. A call router is coupled to the switched communications network and the packet transmission network. A memory is coupled to the call router and having stored therein a call parameter database. The call router is configured to route a telephone call over the switched communications network and the packet transmission network based on at least one call parameter from the call parameter database. The call router is further configured to provide an intelligent service platform. The intelligent service platform includes at least one data client. A data server is coupled between the data client and the memory.

In another aspect of a preferred embodiment of the invention, the intelligent service platform includes a plurality of service engines each configured to execute desired service logic. A service select component is coupled to the service engines to select a service instance running on one of the service engines to process transactions offered by the networks comprising the hybrid telecommunications system.

In another aspect of a preferred embodiment of the invention, the intelligent service platform has a central domain including a master database server configured to control and protect integrity of the database. At least one satellite domain includes a database client configured to provide user access and update capabilities and is coupled to the master database server.

In another aspect of a preferred embodiment of the invention, the intelligent service platform has at least one service engine and a database client coupled between the at least one service engine and the call parameter database to obtain configuration data for customers supported by the at least one service engine.

In another aspect of a preferred embodiment of the invention, the intelligent service platform includes an automated response unit with a plurality of functions available from a single connection.

In another aspect of a preferred embodiment of the invention, at least one service engine is coupled to the call router. The service engine is configured to execute logic defined by the profile information to provide service features customized for the subscriber for whom the profile information pertains.

In another aspect of a preferred embodiment of the invention, a hybrid switch for a telecommunications system includes at least one switched network interface and at least one internet interface. A bus couples the at least one switched network interface and the at least one internet interface. A host processor is coupled to the bus. The hybrid switch is coupled to at least one switched network and at least one internet to form the hybrid telecommunications system. In a further aspect of a preferred embodiment of the invention, a method for processing a communication at a hybrid switch includes receiving a call processing command associated with a particular port of a hybrid switch. A communication is received a the port of the hybrid switch associated with the call processing command. An appropriate plug-and-play module specified in the call processing command is coupled to the particular port of the hybrid switch to process the communication.

In a further aspect of a preferred embodiment of the invention, a method for directing calls in a hybrid telecommunications system including a switched communications network and a packet transmission network stores a call parameter database in a memory. A call is received on the system.

The call parameter database is accessed to determine at least one call parameter. The call is routed over the switched communications network and the packet transmission network based on the at least

one call parameter. The call parameter database is used to provide data for a service that is provided during the call.

In a further aspect of a preferred embodiment of the invention, a plurality of service engines is provided, each configured to execute desired service logic. A service instance running on one of the service engines is selected to process transactions offered by the networks comprising the hybrid telecommunications system.

In a further aspect of a preferred embodiment of the invention, at least one service engine is provided. Configuration data is obtained for customers supported by the at least one service engine from the call parameter database.

In a further aspect of a preferred embodiment of the invention, logic defined by the profile information is

executed to provide service features customized for the subscriber for whom the profile information pertains.

In a further aspect of a preferred embodiment of the invention, an automated response unit is provided. A plurality of functions is made available from a single connection to the automated response unit.

In still another aspect of the invention, a computer program embodied on a computer-readable medium for directing calls in a hybrid telecommunications system including a switched communications network and a packet transmission network has first software that stores a call parameter database in a memory. Second software accesses the call parameter database when the system receives a call to determine at least one call parameter. Third software routes the call over the switched communications network and the packet transmission network based on the at least one call parameter. Fourth software provides at least one service engine. Fifth software obtains configuration data for customers supported by the at least one service engine from the call parameter database.

In still another aspect of the invention, fourth software provides a plurality of service engines each configured to execute desired service logic. Fifth software selects a service instance running on one

of the service engines to process transactions offered by the networks comprising the hybrid telecommunications system.

In still another aspect of the invention, fourth software uses the call parameter database to provide data for a service that is provided during the call. Fifth software couples a media server between media clients and the memory, the media server uses logic to couples one or more of the media clients in a collaborative session in which media is exchanged. The media server includes logic that dynamically adjusts the content transmitted to a media client based on such factors as hardware supporting video, audio or voice; and bandwidth of the network. For example a party joining a media conference from home may not have the necessary hardware to support a video conference call, but may have plenty of bandwidth to support audio and might have a computer for viewing collaborative data.

In still another aspect of the invention, fourth software provides a central domain including a master database server configured to control and protect integrity of the database. Fifth software provides at least one satellite domain including a database client configured to provide user access and update capabilities and being coupled to the master database server.

In still another aspect of the invention, fourth software that executes logic defined by the profile information to provide service features customized for the subscriber for whom the profile information pertains.

In still another aspect of the invention, fourth software provides an automated response unit. Fifth software makes a plurality of functions available from a single connection to the automated response unit.

In still another aspect of the invention, a computer program embodied on a computer- readable medium for processing a communication at a hybrid switch includes first software that receives a call processing command associated with a particular port of a hybrid switch.

Second software receives a communication at the port of the hybrid switch associated with the call processing command. Third software that couples an appropriate plug-and-play module specified in the call processing command to the particular port of the hybrid switch to process the communication.

DESCRIPTION OF THE DRAWINGS The foregoing and other objects, aspects and advantages are better understood from the following detailed description of a preferred embodiment of the invention, with reference to the drawings, in which: Figure 1A is a block diagram of a representative hardware environment in accordance with a preferred embodiment; Figure 1B is a block diagram illustrating the architecture of a typical Common Channel Signaling System 47 (SS7) network in accordance with a preferred embodiment; Figure 1C is a block diagram of an internet telephony system in accordance with a preferred embodiment; Figure 1D is a block diagram of a hybrid switch in accordance with a preferred embodiment; Figure 1E is a block diagram of the connection of a hybrid switch in accordance with a preferred embodiment; Figure 1F is a block diagram of a hybrid (internet-telephony) switch in accordance with a preferred embodiment; Figure 1G is a block diagram showing the software processes involved in the hybrid internet telephony switch in accordance with a preferred embodiment; Figure 2 is a block diagram illustrating the use of PMUs in a typical SS7 network in accordance with a preferred embodiment; Figure 3 is a block diagram illustrating the systems architecture of the preferred embodiment; Figure 4 is a high-level process flowchart illustrating the logical system components in accordance with a preferred embodiment;

Figures 5 - 9 are process flowcharts illustrating the detailed operation of the components illustrated in Figure 4 in accordance with a preferred embodiment; Figure 10A illustrates a Public Switched Telephone Network (PSTN) 1000 comprising a Local Exchange Carrier (LEC) 1020 through which a calling party uses a telephone 1021 or computer 1030 to gain access to a switched network in accordance with a preferred embodiment; Figure 10B illustrates an internet routing network in accordance with a preferred embodiment; Figure 11 illustrates a VNET Personal Computer (PC) to PC Information call flow in accordance with a preferred embodiment; Figure 12 illustrates a VNET Personal Computer (PC) to out-of-network PC Information call flow in accordance with a preferred embodiment; Figure 13 illustrates a VNET Personal Computer (PC) to out-of-network Phone Information call flow in accordance with a preferred embodiment; Figure 14 illustrates a VNET Personal Computer (PC) to in-network Phone Information call flow in accordance with a preferred embodiment; Figure 15 illustrates a personal computer to personal computer internet telephony call in accordance with a preferred embodiment; Figure 16 illustrates a phone call that is routed from a PC through the Internet to a phone in accordance with a preferred embodiment; Figure 17 illustrates a phone to PC call in accordance with a preferred embodiment;

Figure 18 illustrates a phone to phone call over the internet in accordance with a preferred embodiment; Figure 19A and 19B illustrate an Intelligent Network in accordance with a preferred embodiment; Figure 19C illustrates a Video-Conferencing Architecture in accordance with a preferred embodiment; Figure 19D illustrates a Video Store and Forward Architecture in accordance with a preferred embodiment; Figure 19E illustrates an architecture for transmitting video telephony over the Internet in accordance with a preferred embodiment; Figure 19F is a block diagram of an internet telephony system in accordance with a preferred embodiment; Figure 19G is a block diagram of a prioritizing access/router in accordance with a preferred embodiment; Figure 20 is a high level block diagram of a networking system in accordance with a preferred embodiment; Figure 21 is a functional block diagram of a portion of the system shown in Figure 20 in accordance with a preferred embodiment; Figure 22 is another high level block diagram in accordance with a preferred embodiment of Figure 21; Figure 23 is a block diagram of a switchless network system in accordance with a preferred embodiment;

Figure 24 is a hierarchy diagram illustrating a portion of the systems shown in Figures 20 and 23 in accordance with a preferred embodiment; Figure 25 is a block diagram illustrating part of the system portion shown in Figure 24 in accordance with a preferred embodiment; Figure 26 is a flow chart illustrating a portion of a method in accordance with a preferred embodiment; Figures 27-39 are block diagrams illustrating further aspects of the systems of Figures 20 and 23 in accordance with a preferred embodiment; Figure 40 is a diagrammatic representation of a web server logon in accordance with a preferred embodiment; Figure 41 is a diagrammatic representation of a server directory structure used with the logon of Figure 40 in accordance with a preferred embodiment; Figure 42 is a more detailed diagrammatic representation of the logon of Figure 40 in accordance with a preferred embodiment; Figures 43-50 are block diagrams illustrating portions of the hybrid network in accordance with a preferred embodiment; Figure 51 illustrates a configuration of the Data Management Zone (DMZ) 5105 in accordance with a preferred embodiment; Figures 52A-52C illustrate network block diagrams in connection with a dial-in environment in accordance with a preferred embodiment; Figure 53 depicts a flow diagram illustrating the fax tone detection in accordance with a preferred embodiment;

Figures 54A through 54E depict a flow diagram illustrating the VFP Completion process for fax and voice mailboxes in accordance with a preferred embodiment; Figures 55A and 55B illustrate the operation of the Pager Termination processor in accordance with a preferred embodiment; Figure 56 depicts the GetCallback routine called from the pager termination in accordance with a preferred embodiment; Figure 57 shows a user login screen for access to online profile management in accordance with a preferred embodiment; Figure 58 shows a call routing screen, used to set or change a user's call routing instructions in accordance with a preferred embodiment; Figure 59 shows a guest menu configuration screen, used to set up a guest menu for presentation to a caller who is not an account owner in accordance with a preferred embodiment; Figure 60 shows an override routing screen, which allows a user to route all calls to a selected destination in accordance with a preferred embodiment; Figure 61 shows a speed dial numbers screen, used to set up speed dial in accordance with a preferred embodiment; Figure 62 shows a voicemail screen, used to set up voicemail in accordance with a preferred embodiment; Figure 63 shows a faxmail screen, used to set up faxmail in accordance with a preferred embodiment; Figure 64 shows a call screening screen, used to set up call screening in accordance with a preferred embodiment;

Figures 65-67 show supplemental screens used with user profile management in accordance with a preferred embodiment; Figure 68 is a flow chart showing how the validation for user entered speed dial numbers is carried out in accordance with a preferred embodiment; Figures 69A-69Al are automated

response unit (ARU) call flow charts showing software implementation in accordance with a preferred embodiment; Figures 70A-70R are console call flow charts further showing software implementation in accordance with a preferred embodiment; Figure 71 illustrates a typical customer configuration for a VNET to VNET system in accordance with a preferred embodiment; Figure 72 illustrates the operation of DAPs in accordance with a preferred embodiment; Figure 73 illustrates the process by which a telephone connects to a release link trunk for 1- 800 call processing in accordance with a preferred embodiment; Figure 74 illustrates the customer side of a DAP procedure request in accordance with a preferred embodiment; Figure 75 illustrates operation of the switch 10530 to select a particular number or "hotlinen' for a caller in accordance with a preferred embodiment; Figure 76 illustrates the operation of a computer-based voice gateway for selectively routing telephone calls through the Internet in accordance with a preferred embodiment; Figure 77 illustrates the operation of the VRU of figure 76 deployed in a centralized architecture in accordance with a preferred embodiment;

Figure 78 illustrates the operation of the VRU of figure 76 deployed in a distributed architecture in accordance with a preferred embodiment; Figure 79A and 79B illustrate the operation of sample applications for Internet call routing in accordance with a preferred embodiment; Figure 79B illustrates a number of applications for caller-initiated consumer transactions in accordance with a preferred embodiment; Figure 80 illustrates a configuration of a switching network offering voice mail and voice response unit services, as well as interconnection into a service provider, in accordance with a preferred embodiment; Figure 81 illustrates an inbound shared Automated Call Distributor (ACD) call with data sharing through a database in accordance with a preferred embodiment; Figure 82 is a block diagram of an exemplary telecommunications system in accordance with a preferred embodiment; Figure 83 is a block diagram of an exemplary computer system in accordance with a preferred embodiment; Figure 84 illustrates the CDR and PNR call record formats in accordance with a preferred embodiment; Figures 85 (A) and 85(B) collectively illustrate the ECDR and EPNR call record formats in accordance with a preferred embodiment; Figure 86 illustrates the OSR and POSR call record formats in accordance with a preferred embodiment; Figures 87(A) and 87(B) collectively illustrate the EOSR and EPOSR call record formats in accordance with a preferred embodiment;

Figure 88 illustrates the SER call record format in accordance with a preferred embodiment; Figures 89 (A) and 89(B) are control flow diagrams illustrating the conditions under which a switch uses the expanded record format in accordance with a preferred embodiment; Figure 90 is a control flow diagram illustrating the Change Time command in accordance with a preferred embodiment; Figure 91 is a control flow diagram illustrating the Change Daylight Savings Time command in accordance with a preferred embodiment; Figure 92 is a control flow diagram illustrating the Network Call Identifier (NCID) switch call processing in accordance with a preferred embodiment; Figure 93 is a control flow diagram illustrating the processing of a received Network Call Identifier in accordance with a preferred embodiment; Figure 94(A) is a control flow diagram illustrating the generation of a Network Call Identifier in accordance with a preferred embodiment; Figure 94(B) is a control flow diagram illustrating the addition of a Network Call Identifier to a call record in accordance with a preferred embodiment; Figure 95 is a control flow diagram illustrating the transport of a call in accordance with a preferred embodiment; Figure 96 shows a hardware component embodiment for allowing a video operator to participate in a video conferencing platform, providing services including but not limited to monitoring, viewing and recording any video conference call and assisting the video conference callers in accordance with a preferred embodiment;

Figure 97 shows a system for enabling a video operator to manage video conference calls which includes a video operator console system in accordance with a preferred embodiment; Figure 98 shows a system for enabling a video operator to manage video conference calls which includes a video operator console system in accordance with a preferred embodiment; Figure 99 shows how a video conference call initiated by the video operator in accordance with a preferred embodiment; Figure 100 shows the class hierarchy for video operator software system classes in accordance with a preferred embodiment; Figure 101 shows a state transition diagram illustrating the state changes that may occur in the VOCall object's state variable in accordance with a preferred embodiment; Figure 102 shows a state transition diagram illustrating the state changes that may occur in the VOConnection object's m~state variable ("state variable") in accordance with a preferred embodiment; Figure 103 shows a state transition diagram illustrating the state changes that may occur in the VOConference object's m~state variable ("state variable") in accordance with a preferred embodiment; Figure 104 shows a state transition diagram illustrating the state changes that may occur in the VORecorder object's m~state variable ("state variable") in accordance with a preferred embodiment; Figure 105 shows a state transition diagram illustrating the state changes that may occur in the VORecorder object's m~state variable ("state variable") in accordance with a preferred embodiment; Figure 106 shows the class hierarchy for the video operator graphics user interface ("GUI") classes in accordance with a preferred embodiment;

Figure 107 shows a database schema for the video operator shared database in accordance with a preferred embodiment; Figure 108 shows one embodiment of the Main Console window in accordance with a preferred embodiment; Figure 109 shows one embodiment of the Schedule window in accordance with a preferred embodiment; Figure 110 shows one embodiment of the Conference window 41203, which is displayed when the operator selects a conference or playback session in the Schedule window in accordance with a preferred embodiment; Figure 111 shows one embodiment of the Video Watch window 41204, which displays the H.320 input from a selected call of a conference connection or a separate incoming or outgoing call in accordance with a preferred embodiment; Figure 112 shows one embodiment of the Console Output window 41205 which displays all error messages and alerts in accordance with a preferred embodiment; and Figure 113 shows a Properties dialog box in accordance with a preferred embodiment.

DETAILED DESCRIPTION TABLE OF CONTENTS

devices. Because many of these standards are referenced throughout this document, summaries of the relevant standards are listed below for reference.

ITU G.711 Recommendation for Pulse Code Modulation of 3kHz Audio Channels.

ITU G.722 Recommendation for 7kHz Audio Coding within a 64kbit/s channel.

ITU G.723 Recommendation for dual rate speech coder for multimedia communication transmitting at 5.3 and 6.3 kbits.

ITU G.728 Recommendation for coding of speech at 16kbit/s using low-delay code excited linear prediction (LD-CELP) ITU H.221 Frame Structure for a 64 to 1920 kbit/s Channel in Audiovisual Teleservices ITU H.223 Multiplexing Protocols for Low Bitrate Multimedia Terminals

ITU H.225 ITU Recommendation for Media Stream Packetization and Synchronization on non-guaranteed quality of service LANs.

ITU H.230 Frame-synchronous Control and Indication Signals for Audiovisual Systems ITU H.231 Multipoint Control Unit for Audiovisual Systems Using Digital Channels up to 2 Mbit/s ITU H.242 System for Establishing Communication Between Audiovisual Terminals Using Digital Channels up to 2Mbits ITU H.243 System for Establishing Communication Between Three or More Audiovisual Terminals Using Digital Channels up to 2 Mbit/s ITU H.245 Recommendation for a control protocol for multimedia communication ITU H.261 Recommendation for Video Coder-Decoder for audiovisual services supporting video resolutions of 352x288 pixels and 176x144 pixels.

ITU H.263 Recommendation for Video Coder-Decoder for audiovisual services supporting video resolutions of 128x96 pixels, 176x144 pixels, 352x288 pixels, 704x576 pixels and 1408x1152 pixels.

ITU H.320 Recommendation for Narrow Band ISDN visual telephone systems.

ITU H.321 Visual Telephone Terminals over ATM ITU H.322 Visual Telephone Terminals over Guaranteed Quality of Service LANs ITU H.323 ITU Recommendation for Visual Telephone Systems and Equipment for Local Area Networks which provide a non-guaranteed quality of service.

ITU H.324 Recommendation for Terminals and Systems for low bitrate(28.8 Kbps) multimedia communication on dial-up telephone lines.

ITU T.120 Transmission Protocols for Multimedia Data.

In addition, several other relevant standards are referenced in this document: ISDN Integrated Services Digital Network, the digital communication standard for transmission of voice, video and data on a single communications link.

RTP Real-Time Transport Protocol, an Internet Standard Protocol for transmission of real- time data like voice and video over unicast and multicast networks.

IP Internet Protocol, an Internet Standard Protocol for transmission and delivery of data packets on a packet switched network of interconnected computer systems.

PPP Point-to-Point Protocol MPEG Motion Pictures Expert Group, a standards body under the International Standards Organization(ISO) Recommendations for compression of digital Video and Audio including the bit stream but not the compression algorithms.

SLIP Serial Line Internet Protocol RSVP Resource Reservation Setup Protocol UDP User Datagram Protocol

III. TCP/IP FEATURES The popularity of the TCP/IP protocols on the Internet grew rapidly because they met an important need for worldwide data communication and had several important characteristics that allowed them to meet this need. These characteristics, still in use today, include: A common addressing scheme that allows any device running TCP/IP to uniquely address any other device on the Internet.

Open protocol standards, freely available and developed independently of any hardware or operating system. Thus, TCP/IP is capable of being used with different hardware and software, even if Internet communication is not required.

Independence from any specific physical network hardware, allows TCP/IP to integrate many different kinds of networks. TCP/IP can be used over an Ethernet, a token ring, a dial-up line, or virtually any other kinds of physical transmission media.

IV. INFORMATION TRANSPORT IN COMMUNICATION NETWORKS A. Switching Techniques An understanding of how information travels in communication systems is required to appreciate the recent steps taken by key players in today's Internet backbone business. The traditional type of communication network is circuit switched. The U.S. telephone system uses such circuit switching techniques. When a person or a computer makes a telephone call, the switching equipment within the telephone system seeks out a physical path from the originating telephone to the receiver's telephone. A circuit-switched network attempts to form a dedicated connection, or circuit, between these two points by first establishing a circuit from the originating phone through the local switching office, then across trunk lines, to a remote switching office, and finally to the destination telephone. This dedicated connection exists until the call terminates.

The establishment of a completed path is a prerequisite to the transmission of data for circuit switched networks. After the circuit is in place, the microphone captures analog signals, and

the signals are transmitted to the Local Exchange Carrier (LEC) Central Office (CO) in analog form over an analog loop. The analog signal is not converted to digital form until it reaches the LEC Co, and even then only if the equipment is modern enough to support digital information. In an ISDN embodiment, however, the analog signals are converted to digital at the device and transmitted to the LEC as digital information.

Upon connection, the circuit guarantees that the samples can be delivered and reproduced by maintaining a data path of 64 Kbps (thousand bits per second). This rate is not the rate required to send digitized voice per se. Rather, 64Kbps is the rate required to send voice digitized with the Pulse Code Modulated (PCM) technique. Many other methods for digitizing voice exist, including ADPCM (32Kbps), GSM (13 Kbps), TrueSpeech 8.5 (8.5 Kbps), G.723 (6.4 Kbps or 5.3 Kbps) and Voxware RT29HQ (2.9 Kbps). Furthermore, the 64 Kbps path is maintained from LEC Central Office (CO) Switch to LEC CO, but not from end to end. The analog local loop transmits an analog signal, not 64 Kbps digitized audio.

One of these analog local loops typically exists as the "last mile" of each of the telephone network circuits to attach the local telephone of the calling party.

This guarantee of capacity is the strength of circuit-switched networks. However, circuit switching has two significant drawbacks. First, the setup time can be considerable, because the call signal request may find the lines busy with other calls; in this event, there is no way to gain connection until some other connection terminates. Second, utilization can be low while costs are high. In other words, the calling party is charged for the duration of the call and for all of the time even if no data transmission takes place (i.e. no one speaks).

Utilization can be low because the time between transmission of signals is unable to be used by any other calls, due to the dedication of the line. Any such unused bandwidth during the connection is wasted.

Additionally, the entire circuit switching infrastructure is built around 64 Kbps circuits. The infrastructure assumes the use of PCM encoding techniques for voice. However, very high quality codecs are available that can encode voice using less than one-tenth of the bandwidth of PCM. However, the circuit switched network blindly allocates 64 Kbps of bandwidth for a call, end-to-end, even if only one-tenth of the bandwidth is utilized. Furthermore, each circuit generally only connects two parties. Without the assistance of conference bridging

equipment an entire circuit to a phone is occupied in connecting one party to another party.

Circuit switching has no multicast or multipoint communication capabilities, except when used in combination with conference bridging equipment.

Other reasons for long call setup time include the different signaling networks involved in call setup and the sheer distance causing propagation delay. Analog signaling from an end station to a CO on a low bandwidth link can also delay call setup. Also, the call setup data travels great distances on signaling networks that are not always transmitting data at the speed of light. When the calls are international, the variations in signaling networks grows, the equipment handling call setup is usually not as fast as modem setup and the distances are even greater, so call setup slows down even more. Further, in general, connection-oriented virtual or physical circuit setup, such as circuit switching, requires more time at connection setup time than comparable connectionless techniques due to the end-to-end handshaking required between the conversing parties.

Message switching is another switching strategy that has been considered. With this form of switching, no physical path is established in advance between the sender and receiver; instead, whenever the sender has a block of data to be sent, it is stored at the first switching office and retransmitted to the next

switching point after error inspection. Message switching places no limit on block size, thus requiring that switching stations must have disks to buffer long blocks of data; also, a single block may tie up a line for many minutes, rendering message switching useless for interactive traffic.

Packet switched networks, which predominate the computer network industry, divide data into small pieces called packets that are multiplexed onto high capacity intermachine connections. A packet is a block of data with a strict upper limit on block size that carries with it sufficient identification necessary for delivery to its destination. Such packets usually contain several hundred bytes of data and occupy a given transmission line for only a few tens of milliseconds. Delivery of a larger file via packet switching requires that it be broken into many small packets and sent one at a time from one machine to the other. The network hardware delivers these packets to the specified destination, where the software reassembles them into a single file.

Packet switching is used by virtually all computer interconnections because of its efficiency in data transmissions. Packet switched networks use bandwidth on a circuit as needed.

allowing other transmissions to pass through the lines in the interim. Furthermore, throughput is increased by the fact that a router or switching office can quickly forward to the next stop any given packet, or portion of a large file, that it receives, long before the other packets of the file have arrived. In message switching, the intermediate router would have to wait until the entire block was delivered before forwarding. Today, message switching is no longer used in computer networks because of the superiority of packet switching.

To better understand the Internet, a comparison to the telephone system is helpful. The public switched telephone network was designed with the goal of transmitting human voice, in a more or less recognizable form. Their suitability has been improved for computer-to- computer communications but remains far from optimal. A cable running between two computers can transfer data at speeds in the hundreds of megabits, and even gigabits per second. A poor error rate at these speeds would be only one error per day. In contrast, a dial- up line, using standard telephone lines, has a maximum data rate in the thousands of bits per second, and a much higher error rate. In fact, the combined bit rate times error rate performance of a local cable could be 11 orders of magnitude better than a voice-grade telephone line. New technology, however, has been improving the performance of these lines.

B. Gateways and Routers The Internet is composed of a great number of individual networks, together forming a global connection of thousands of computer systems. After understanding that machines are connected to the individual networks, we can investigate how the networks are connected together to form an internetwork, or an internet. At this point, internet gateways and internet routers come into play.

In terms of architecture, two given networks are connected by a computer that attaches to both of them. Internet gateways and routers provide those links necessary to send packets between networks and thus make connections possible. Without these links, data communication through the Internet would not be possible, as the information either would

not reach its destination or would be incomprehensible upon arrival. A gateway may be thought of as an entrance to a communications network that performs code and protocol conversion between two otherwise incompatible networks. For instance, gateways transfer electronic mail and data files between networks over the Internet.

IP Routers are also computers that connect networks and is a newer term preferred by vendors. These routers must make decisions as to how to send the data packets it receives to its destination through the use of continually updated routing tables. By analyzing the destination network address of the packets, routers make these decisions. Importantly, a router does not generally need to decide which host or end user will receive a packet; instead, a router seeks only the destination network and thus keeps track of information sufficient to get to the appropriate network, not necessarily the appropriate end user. Therefore, routers do not need to be huge supercomputing systems and are often just machines with small main memories and little disk storage. The distinction between gateways and routers is slight, and current usage blurs the line to the extent that the two terms are often used interchangeably. In current terminology, a gateway moves data between different protocols and a router moves data between different networks. So a system that moves mail between TCP/IP and OSI is a gateway, but a traditional IP gateway (that connects different networks) is a router.

Now, it is useful to take a simplified look at routing in traditional telephone systems. The telephone system is organized as a highly redundant, multilevel hierarchy. Each telephone has two copper wires coming out of it that go directly to the telephone company's nearest end office, also called a local central office. The distance is typically less than 10 km; in the U.S.

alone, there are approximately 20,000 end offices. The concatenation of the area code and the first three digits of the telephone number uniquely specify an end office and help dictate the rate and billing structure.

The two-wire connections between each subscriber's telephone and the end office are called local loops. If a subscriber attached to a given end office calls another subscriber attached to the same end office, the switching mechanism within the office sets up a direct electrical connection between the two local loops. This connection remains intact for the duration of the call, due to the circuit switching techniques discussed earlier.

If the subscriber attached to a given end office calls a user attached to a different end office, more work has to be done in the routing of the call. First, each end office has a number of outgoing lines to one or more nearby switching centers, called toll offices. These lines are called toll connecting trunks. If both the caller's and the receiver's end offices happen to have a toll connecting trunk to the same toll office, the connection may be established within the toll office. If the caller and the recipient of the call do not share a toll office, then the path will have to be established somewhere higher up in the hierarchy. There are sectional and regional offices that form a network by which the toll offices are connected. The toll, sectional, and regional exchanges communicate with each other via high bandwidth inter-toll trunks. The number of different kinds of switching centers and their specific topology varies from country to country, depending on its telephone density.

C. Using Network Level Communication for Smooth User Connection In addition to the data transfer functionality of the Internet, TCP/IP also seeks to convince users that the Internet is a solitary, virtual network. TCP/IP accomplishes this by providing a universal interconnection among machines, independent of the specific networks to which hosts and end users attach. Besides router interconnection of physical networks, software is required on each host to allow application programs to use the Internet as if it were a single, real physical network.

D. Data grams and Routing The basis of Internet service is an underlying, connectionless packet delivery system run by routers, with the basic unit of transfer being the packet. In internets running TCP/IP, such as the Internet backbone, these packets are called datagrams. This section will briefly discuss how these datagrams are routed through the Internet.

In packet switching systems, routing is the process of choosing a path over which to send packets. As mentioned before, routers are the computers that make such choices. For the routing of information from one host within a network to another host on the same network, the datagrams that are sent do not actually reach the Internet backbone. This is an example of

internal routing, which is completely self-contained within the network. The machines outside of the network do not participate in these internal routing decisions.

At this stage, a distinction should be made between direct delivery and indirect delivery.

Direct delivery is the transmission of a datagram from one machine across a single physical network to another machine on the same physical network. Such deliveries do not involve routers. Instead, the sender encapsulates the datagram in a physical frame, addresses it and then sends the frame directly to the destination machine.

Indirect delivery is necessary when more than one physical network is involved, in particular when a machine on one network wishes to communicate with a machine on another network.

This type of communication is what we think of when we speak of routing information across the Internet backbone. In indirect delivery, routers are required. To send a datagram, the sender must identify a router to which the datagram can be sent and the router then forwards the datagram towards the destination network. Recall that routers generally do not keep track of the individual host addresses (of which there are millions), but rather just keeps track of physical networks (of which there are thousands). Essentially, routers in the Internet form a cooperative, interconnected structure, and datagrams pass from router to router across the backbone until they reach a router that can deliver the datagram directly.

V. TECHNOLOGY INTRODUCTION The changing face of the internet world causes a steady inflow of new systems and technology. The following three developments, each likely to become more prevalent in the near future, serve as an introduction to the technological arena: A. ATM Asynchronous Transfer Mode (ATM) is a networking technology using a high-speed, connection-oriented system for both local area and wide area networks. ATM networks require modern hardware including: High speed switches that can operate at gigabit (trillion bit) per second speeds to handle the traffic from many computers;

Optical fibers (versus copper wires) that provide high data transfer rates, with host-to-ATM switch connections running at 100 or 155 Mbps (million bits per second); Fixed size cells, each of which includes 53 bytes.

ATM incorporates features of both packet switching and circuit switching, as it is designed to carry voice, video, and television signals in addition to data. Pure packet switching technology is not conducive to carrying voice transmissions because such transfers demand more stable bandwidth.

B. Frame Relay Frame relay systems use packet switching techniques, but are more efficient than traditional systems. This efficiency is partly due to the fact that they perform less error checking than traditional X.25 packet-switching services. In fact, many intermediate nodes do little or no error checking at all and only deal with routing, leaving the error checking to the higher layers of the system. With the greater reliability of today's transmissions, much of the error checking previously performed has become unnecessary. Thus, frame relay offers increased performance compared to traditional systems.

C. ISDN An Integrated Services Digital Network is an "international telecommunications standard for transmitting voice, video, and data over digital lines," most commonly running at 64 kilobits per second. The traditional phone network runs voice at only 4 kilobits per second. To adopt ISDN, an end user or company must upgrade to ISDN terminal equipment, central office hardware, and central office software. The ostensible goals of ISDN include the following: 1. To provide an internationally accepted standard for voice, data and signaling; 2. To make all transmission circuits end-to-end digital; 3. To adopt a standard out-of-band signaling system; and To bring significantly more bandwidth to the desktop.

VI. MCI INTELLIGENT NETWORK The MCI Intelligent Network is a call processing architecture for processing voice, fax and related services. The Intelligent Network comprises a special purpose bridging switch with special capabilities and a set of general purpose computers along with an Automatic Call Distributor (ACD). The call processing including number translation services, automatic or manual operator services, validation services and database services are carried out on a set of dedicated general purpose computers with specialized software. New value added services can be easily integrated into the system by enhancing the software in a simple and cost- effective manner.

Before proceeding further, it will be helpful to establish some terms.

ISP Intelligent Services Platform NCS Network Control System DAP Data Access Point ACD Automatic Call Distributor ISN Intelligent Services Network (Intelligent Network) ISNAP Intelligent Services Network Adjunct Processor MTOC Manual Telecommunications Operator Console ARU Audio Response Unit ACP Automatic Call Processor NAS Network Audio Server EVS Enhanced Voice Services POTS ' Plain Old Telephone System ATM Asynchronous Transfer Mode The Intelligent Network Architecture has a rich set of features and is very flexible. Addition of new features and services is simple and fast. Features and services are extended utilizing special purpose software running on general purpose computers. Adding new features and services involves upgrading the special purpose software and is cost-effective.

Intelligent Network Features and Services include Call type identification; Call Routing and selective termination;

Operator selection and call holding; Manual and Automated Operator; Voice Recognition and automated, interactive response; Customer and customer profile verification and validation; Voice Mail, Call validation and database; Audio Conference reservation; Video Conference reservation; Fax delivery and broadcasting; Customer Billing; Fraud Monitoring; Operational Measurements and Usage Statistics reporting; and Switch interface and control.

A. Components of the MCI Intelligent Network Figure 19A illustrates an Intelligent Network in accordance with a preferred embodiment.

The MCI Intelligent Network is comprised of a large number of components. Major components of the MCI Intelligent Network include the MCI Switching Network 2 Network Control System (NC S)/Data Access Point(DAP) 3 ISN - Intelligent Services Network 4 EVS - Enhanced Voice Services 9 1. MCI Switching Network The MCI switching network is comprised of special purpose bridging switches 2. These bridging switches 2 route and connect the calling and the called parties after the call is validated by the intelligent services network 4. The bridging switches have limited programming capabilities and provide the basic switching services under the control of the Intelligent Services Network (ISN) 4.

2. Network Control System/Data Access Point (NCS/DAP) The NCS/DAP 3 is an integral component of the MCI Intelligent Network. The DAP offers a variety of database services like number translation and also provides services for identifying the switch ID and trunk ID of the terminating number for a call.

The different services offered by NCS/DAP 3 include: Number Translation for 800, 900, VNET Numbers; Range Restrictions to restrict toll calling options and advanced parametric routing including Time of Day, Day of Week/Month, Point of Origin and percentage allocation across multiple sites; Information Database including Switch ID and Trunk ID of a terminating number for a given call; Remote Query to Customer Databases; VNET/950 Card Validation Services; and VNET ANI/DAL Validation Services.

3. Intelligent Services Network (ISN) 4 The ISN 4 includes an Automatic Call Distributor (ACD) for routing the calls. The ACD communicates with the Intelligent Switch Network Adjunct Processor (ISNAP) 5 and delivers calls to the different manual or automated agents. The ISN includes the ISNAP 5 and the Operator Network Center (ONC). ISNAP 5 is responsible for Group Select and Operator Selection for call routing. The ISNAP communicates with the ACD for call delivery to the different agents. The ISNAP is also responsible for coordinating data and voice for operator-assisted calls. The ONC is comprised of Servers, Databases and Agents including Live Operators or Audio Response Units (ARU) including Automated Call Processors (ACP)s, MTOCs and associated NAS 7. These systems communicate with each other on an Ethernet LAN and provide a variety of services for call processing.

The different services offered by the ONC include: Validation Services including call-type identification, call verification and call restrictions if any; Operator Services, both manual and automated, for customer assistance;

Database Services for a variety of database lookups; Call Extending Capabilities; Call Bridging Capabilities; Prompt for User Input; and Play Voice Messages.

4. Enhanced Voice Services (EVS) 9 Enhanced Voice Services offer menu-based routing services in addition to a number of value- added features. The EVS system prompts the user for an input and routes calls based on customer input or offers specialized services for voice mail and fax routing. The different services offered as a part of the EVS component of the MCI Intelligent Network include: Play Customer Specific Voice Messages; Prompt for User Input; User Input based Information Access; Call Extending Capabilities; Call Bridging Capabilities; Audio Conference Capabilities; Call Transfer Capabilities; Record User Voice Messages; Remote Update of Recorded Voice; and Send/Receive Fax.

5. Additional Components In addition to the above mentioned components, a set of additional components are also architected into the MCI Intelligent Network. These components are: Intelligent Call Routing (ICR) services are offered for specialized call routing based on information obtained from the calling party either during the call or at an earlier time. Routing is also based on the knowledge of the physical and logical network layout. Additional intelligent routing services based on time of day, alternate routing based on busy routes are also offered.

Billing is a key component of the MCI Intelligent Network. The billing component provides services for customer billing based on call type and call duration.

Specialized billing services are additionally provided for value added services like the 800 Collect calls.

Fraud Monitoring component is a key component of the MCI Intelligent Network providing services for preventing loss of revenue due to fraud and illegal usage of the network.

Operational Measurements include information gathering for analysis of product performance. Analysis of response to advertising campaigns, calling patterns resulting in specialized reports result from operational measurements. Information gathered is also used for future product planning and predicting infrastructure requirements.

Usage Statistics Reporting includes gathering information from operational databases and billing information to generate reports of usage. The usage statistics reports are used to study call patterns, load patterns and also demographic information. These reports are used for future product plans and marketing input.

B. Intelligent Network System Overview The MCI Call Processing architecture is built upon a number of key components including the MCI Switch Network, the Network Control System, the Enhanced Voice Services system and the Intelligent Services Network. Call processing is entirely carried out on a set of general purpose computers and some specialized processors thereby forming the basis for the MCI Intelligent Network. The switch is a special purpose bridging switch with limited programming capabilities and complex interface. Addition of new services on the switch is very difficult and sometimes not possible. A call on the MCI Switch is initially verified if it needs a number translation as in the case of an 800 number. If a number translation is required, it is either done at the switch itself based on an internal table or the request is sent to the DAP which is a general purpose computer with software capable of number translation and also determining the trunk ID and switch ID of the terminating number.

The call can be routed to an ACD which delivers calls to the various call processing agents like a live operator or an ARU. The ACD communicates with the ISNAP which does a group select to determine which group of agents are responsible for this call and also which of the agents are free to process this call.

The agents process the calls received by communicating with the NIDS (Network Information Distributed Services) Server which are the Validation or the Database Servers with the requisite databases for the various services offered by ISN. Once the call is validated by processing of the call on the server, the agent communicates the status back to the ACD.

The ACD in turn dials the terminating number and bridges the incoming call with the terminating number and executes a Release Link Trunk (RLT) for releasing the call all the way back to the switch. The agent also generates a Billing Detail Record (BDR) for billing information. When the call is completed, the switch generates an Operation Services Record (OSR) which is later matched with the corresponding BDR to create total billing information.

The addition of new value added services is very simple and new features can be added by additional software and configuration of the different computing systems in the ISP. A typical call flow scenario is explained below.

C. Call Flow Example The Call Flow example illustrates the processing of an 800 Number Collect Call from phone 1 in Figure 19A to phone 10. The call is commenced when a calling party dials 1-800-COLLECT to make a collect call to phone 10 the Called Party. The call is routed by the Calling Party's Regional Bell Operating Company (RBOC), which is aware that this number is owned by MCI, to a nearest MCI Switch Facility and lands on an MCI switch 2.

The switch 2 detects that it is an 800 Number service and performs an 800 Number Translation from a reference table in the switch or requests the Data Access Point (DAP) 3 to provide number translation services utilizing a database lookup.

The call processing is now delegated to a set of intelligent computing systems through an Automatic Call Distributor (ACD) 4. In this example, since it is a collect call, the calling party has to reach a Manual or an Automated Operator before the call can be processed

further. The call from the switch is transferred to an ACD 4 which is operational along with an Intelligent Services Network Adjunct Processor (ISNAP) 5. The ISNAP 5 determines which group of Agents are capable of processing the call based on the type of the call. This operation is referred to as Group Select. The agents capable of call processing include Manual Telecommunications Operator Console (MTOC)s 6 or Automated Call Processors (ACP)s 7 with associated Network Audio Servers (NAS)s 7a. The ISNAP 5 determines which of the Agents is free to handle the call and routes the voice call to a specific Agent.

The Agents are built with sophisticated call processing software. The Agent gathers all the relevant information from the Calling Party including the telephone number of the Called Party. The Agent then communicates with the database servers with a set of database lookup requests. The database lookup requests include queries on the type of the call, call validation based on the telephone numbers of both the calling and the called parties and also call restrictions, if any, including call blocking restrictions based on the called or calling party's telephone number. The Agent then signals the ISNAP-ACD combination to put the Calling Party on hold and dial the called party and to be connected to the Called Party. The Agent informs the called party about the Calling Party and the request for a Collect Call. The Agent gathers the response from the Called Party and further processes the call.

If the Called Party has agreed to receive the call, the Agent then signals the ISNAP-ACD combination to bridge the Called Party and the Calling Party.

The Agent then outs a BDR which is used to match with a respective OSR generated by the switch to create complete billing information. The ISNAP-ACD combination then bridges the Called Party and the Calling Party and then releases the line back to the switch by executing a Release Trunk (RLT). The Calling Party and the Called Party can now have a conversation through the switch. At the termination of the call by either party, the switch generates a OSR which will be matched with the BDR generated earlier to create complete billing information for the call. If the Called Party declines to accept the collect call, the Agent signals the ACD-ISNAP combination to reconnect the Calling Party which was on hold back to the Agent. Finally, the Agent informs the Calling Party about the Called Party's response and terminates the call in addition to generating a BDR.

MCI Intelligent Network is a scalesble and efficient network architecture for call processing and is based

on a set of intelligent processors with specialized software, special purpose bridging switches and ACD's. The Intelligent Network is an overlay network coexisting with the MCI Switching Network and is comprised of a large number of specialized processors interacting with the switch network for call processing. One embodiment of Intelligent Network is completely audio-centric. Data and fax are processed as voice calls with some specialized, dedicated features and value-added services.

In another embodiment, the Intelligent Network is adapted for newly emerging technologies, including POTS-based video-phones and internet telephony for voice and video. The following sections describe in detail the architecture, features and services based on the emerging technologies.

COMPATIBILITY OF ISN WITH EMERGING TECHNOLOGIES The following sections describe in detail the architecture, features and services based on several emerging technologies, all of which can be integrated into the Intelligent Network.

VII. ISP FRAMEWORK A. Background The ISP is composed of several disparate systems. As ISP integration proceeds, formerly independent systems now become part of one larger whole with concomitant increases in the level of analysis, testing, scheduling, and training in all disciplines of the ISP.

1. Broadband Access A range of high bandwidth services are supported by a preferred embodiment. These include: Video on Demand, Conferencing, Distance Learning, and Telemedicine.

ATM (asynchronous transfer mode) pushes network control to the periphery of the network, obviating the trunk and switching models of traditional, circuit-based telephony. It is expected to be deployed widely to accommodate these high bandwidth services.

2. Internet Telephony System The Internet and with it, the World Wide Web, offers easy customer access, widespread commercial opportunities, and fosters a new role for successful telecommunications companies. The ISP platform offers many features which can be applied or reapplied from telephony to the Internet. These include access, customer equipment, personal accounts, billing, marketing (and advertising) data or application content, and even basic telephone service.

The telecommunication industry is a major transmission provider of the Internet. A preferred embodiment which provides many features from telephony environments for Internet clients is optimal.

Figure 19F is a block diagram of an internet telephony system in accordance with a preferred embodiment. A number of computers 1900, 1901, 1902 and 1903 are connected behind a firewall 1905 to the Internet 1910 via an Ethernet or other network connection. A domain name system 1906 maps names to IP addresses in the Internet 1910. Individual systems for billing 1920, provisioning 1922, directory services 1934, messaging services 1930, such as voice messaging 1932 are all attached to the Internet 1910 via a communication link.

Another communication link is also utilized to facilitate communications to a satellite device 1940 that is used to communicate information to a variety of set top devices 1941-1943. A web server 1944 provides access for an order entry system 1945 to the Internet 1910.

In an embodiment, the order entry system 1945 generates complete profile information for a given telephone number, including, name, address, fax number, secretary's number, wife's phone number, pager, business address, e-mail address, IP address and phonemail address.

This information is maintained in a database that can be accessed by everyone on the network with authorization to do so. In an alternate embodiment, the order entry system utilizes a web interface for accessing an existing directory service database 1934 to provide information for the profile to supplement user entered information.

The Internet 1910 is tied to the Public Switched Network (PSTN) 1960 via a gateway 1950.

The gateway 1950 in a preferred embodiment provides a virtual connection from a circuit switched call in the PSTN 1960 and some entity in the Internet 1910.

The PSTN 1960 has a variety of systems attached, including a direct-dial input 1970, a Data Access Point (DAP) 1972 for facilitating 800 number processing and Virtual NETwork (VNET) processing to facilitate for example a company tieline. A Public Branch Exchange (PBX) 1980 is also attached via a communication link for facilitating communication between the PSTN 1960 and a variety of computer equipment, such as a fax 1981, telephone 1982 and a modem 1983. An operator 1973 can also optionally attach to a call to assist in placing a call or conference call coming into and going out of the PSTN 1960 or the Internet 1910.

Various services are attached to the PSTN through individual communication links including an attachment to the Intelligent Services Network (ISN) 1990, direct-dial plan 1991, provisioning 1974, order entry 1975, billing 1976, directory services 1977, conferencing services 1978, and authorization / authentication services 1979. All of these services can communicate between themselves using the PSTN 1960 and the Internet 1910 via a gateway 1950. The functionality of the ISN 1990 and the DAP 1972 can be utilized by devices attached to the Internet 1910.

Figure 19G is a block diagram of a Prioritizing Access/Router in accordance with a preferred embodiment. A prioritizing access router (PAR) is designed to combine the features of an internet access device and an Internet Protocol (IP) Router. It enables dial-up modem access to the internet by performing essential modem and PPP/SLIP to IP and the reverse IP to PPP/SLIP conversion. It also analyzes IP packet source/destination addresses and UPD or TCP ports and selects appropriate outgoing network interfaces for each packet. Lastly, it uses a priority routing technique to favor packets destined for specific network interfaces over packets destined for other network interfaces.

The design goal of the prioritizing access/router is to segregate real-time traffic from the rest of the best-effort data traffic on internet networks. Real-time and interactive multimedia traffic is best segregated from traffic without real-time constraints at the access point to the

internet, so that greater control over quality of service can be gained. The process that a prioritizing access/router utilizes is presented below with reference to Figure 19G.

First, at 2010, a computer dials up the PAR via a modem. The computer modem negotiates a data transfer rate and modem protocol parameters with the PAR modem. The computer sets up a Point to Point Protocol (PPP) session with the PAR using the modem to modem connection over a Public Switched Telephone Network (PSTN) connection.

The computer transfers Point-to-Point (PPP) packets to the PAR using the modem connection. The PAR modem 2010 transfers PPP packets to the PPP to IP conversion process 2020 via the modem to host processor interface 2080. The modem to host processor interface can be any physical interface presently available or yet to be invented. Some current examples are ISA, EISA, VME, SCbus, MVIP bus, Memory Channel, and TDM buses. There is some advantage in using a multiplexed bus such as the Time Division Multiplexing buses mentioned here, due to the ability to devote capacity for specific data flows and preserve deterministic behavior.

The PPP to IP conversion process 2020 converts PPP packets to IP packets, and transfers the resulting IP packets to the packet classifier 2050 via the process to process interface 2085.

The process to process interface can be either a physical interface between dedicated processor hardware, or can be a software interface. Some examples of process to process software interfaces include function or subroutine calls, message queues, shared memory, direct memory access (DMA), and mailboxes.

The packet classifier 2085 determines if the packet belongs to any special prioritized group.

The packet classifier keeps a table of flow specifications, defined by destination IP Address source IP address combined source/destination IP Address combined destination IP Address/UDP Port combined destination IP Address/TCP Port combined source IP address/UDP Port combined source IP Address/ TCP Port combined source IP Address and TCP or UDP port with destination IP address

combined destination IP Address and TCP or UDP port with source IP address combined source IP Address and TCP or UDP port with destination IP address and TCP/UDP Port.

The packet classifier checks its table of flow specifications against the IP addresses and UDP or TCP ports used in the packet. If any match is found, the packet is classified as belonging to a priority flow and labeled as with a priority tag. Resource Reservation Setup Protocol techniques may be used for the packet classifier step.

The packet classifier 2050 hands off priority tagged and non-tagged packets to the packet scheduler 2060 via the process to process interface (90). The process to process interface 2090 need not be identical to the process to process interface 2085, but the same selection of techniques is available. The packet scheduler 2060 used a priority queuing technique such as Weighted Fair Queueing to help ensure that prioritized packets (as identified by the packet classifier) receive higher priority and can be placed on an outbound network interface queue ahead of competing best-effort traffic.

The packet scheduler 2060 hands off packets in prioritized order to any outbound network interface

(2010, 2070, 2071 or 2072) via the host processor to peripheral bus 2095. Any number of outbound network interfaces may be used.

IP packets can arrive at the PAR via non-modem interfaces (2070, 2071 and 2072). Some examples of these interfaces include Ethernet, fast Ethernet, FDDI, ATM, and Frame Relay.

These packets go through the same steps as IP packets arriving via the modem PPP interfaces.

The priority flow specifications are managed through the controller process 2030. The controller process can accept externally placed priority reservations through the external control application programming interface 2040. The controller validates priority reservations for particular flows against admission control procedures and policy procedures, and if the reservation is admitted, the flow specification is entered in the flow specification table in the packet classifier 2050 via the process to process interface 2065. The process to

process interface 2065 need not be identical to the process to process interface 2085, but the same selection of techniques is available.

Turning now to Figure 20, there is shown an architectural framework for an Intelligent Services Platform (ISP) 2100, used in the present invention. The architecture of the ISP 2100 is intended to define an integrated approach to the provision and delivery of intelligent services to the MCI network across all the components of the ISP.

Each of the existing communication network systems has its own way of providing service management, resource management, data management, security, distributed processing network control, or operations support. The architecture of the ISP 2100 defines a single cohesive architectural framework covering these areas. The architecture is focused on achieving the following goals: Develop global capabilities; Deliver enhanced future services; Make efficient use of resources; Improve time to market; Reduce maintenance and operations costs; Increase overall product quality; and Introduce scalability both upward and downward capabilities.

The target capabilities of the ISP 2100 are envisioned to provide the basic building blocks for very many services. These services are characterized as providing higher bandwidth, greater customer control or personal flexibility, and much reduced even instantaneous, provisioning cycles.

3. Capacity The ISP 2100 has a reach that is global and ubiquitous. Globally, it will reach every country through alliance partners' networks. In breadth, it reaches all business and residential locales through wired or wireless access.

4. Future Services The above capabilities will be used to deliver: Telephony and messaging services beyond what we have today; Emerging video and multi-media offerings; Powerful data services, including enhanced private networks; and Software and equipment to enable end users to gain complete control over their services.

Services provided by the ISP 2100 will span those needed in advertising, agriculture, education, entertainment, finance, government, law, manufacturing, medicine, network transmission, real estate, research, retailing, shipping, telecommunications, tourism, wholesaling, and many others.

Services: Customizable: customer is able to tailor the service offerings to their own needs.

Customer managed: customer has direct (network-side) access for the administration and control of their service.

Loosely Coupled: services obtain and use network resources only when needed; customers pay for only what they use. Bandwidth is available on demand, and without pre-allocation.

Secure & Private: customer privacy and confidentiality is paramount in the networked world. Commercial interests are guaranteed safe, secure transactions. Users and customers are identified and authenticated, and the network protected from tampering or corruption.

B. ISPArchitecture Framework The following section describes the role of the ISP Platform 2100 in providing customer services.

The ISP 2100 provides customer services through an intelligent services infrastructure, including provider network facilities 2102, public network facilities 2104, and customer

equipment 2106. The services infrastructure ensures the end-to-end quality and availability of customer service.

The following section describes the relationship of the ISP platform 2100 to various external systems both within and outside a provider.

The provider components 2108 in Figure 20 are: Intelligent Services 2110 - responsible for service provisioning, service delivery, and service assurance, including the internal data communications networks 2102. This represents the ISP's role.

Revenue Management 2112 - responsible for financial aspects of customer services.

Network Management 2114 - responsible for the development and operation of the physical networks 2102.

Product Management 2116 - responsible for the creation and marketing of customer services.

The entities external to the ISP 2100 depicted in Figure 20 are: Networks 2104- this represents all the network connections and access methods used by customers 2106 for service. This includes a provider's circuit switched network, packet switched networks, internal extended wide area network, the internet, a provider's wireless partners' networks, a provider's global alliance and national partner networks, broadband networks, as well as the customer premises equipment 2118 attached to these networks.

3rd party Service Providers 2120 - this represents those external organizations which deliver services to customers via the provider's Intelligent Services Platform 2100.

Service Resellers 2122 - this represents those organizations which have customers using the facilities 2100.

Global Alliance Partners 2124 - organizations which have shared facilities and exchange capabilities of their networks and service infrastructures.

C. ISP Functional Framework Figure 21 shows components of the ISP 2100 in more detail. Shown is the set of logical components comprising the ISP 2100 architecture. None of these components is a single physical entity; each typically occurs multiple times in multiple locations. The components

work together to provide a seamless Intelligent Services 2110 environment. This environment is not fixed; it is envisioned as a flexible evolving platform capable of adding new services and incorporating new technologies as they become available. The platform components are linked by one or more network connections which include an internal distributed processing infrastructure.

The ISP 2100 Functional Components are: Inbound and Outbound Gateways 2126 - allows access to services provided by other providers, and allows other providers to access the provider's services.

Marketable Service Gateway 2128- interface to a three-tier service creation environment for services the provider sells. Services are deployed and updated through the Marketable Service Gateway 2128. This is actually no different than the Management Service Gateway 2130, except that the services created and deployed through here are for external customers.

Management Service Gateway 2130 - illustrates that service creation concepts apply to management of the platform as well as service logic. Management services are deployed and managed through the Management Service Gateway 2130. Also, interfaces with management systems external to ISP 2100 are realized by the Management Service Gateway 2130. Some examples of management services include the collection, temporary storage, and forwarding of (billable) network events. Other services include collection and filtering of alarm information from the ISP 2100 before forwarding to network management 2132.

Service Engines 2134 - A Service Logic Execution Environment for either marketable or management services. The Service Engines 2134 execute the logic contained in customer- specific profiles in order to provide unique customized service features.

Service Creation Environment 2136 - Creates and deploys management services as well as marketable services, and their underlying features and capabilities.

Data Management 2138- Where all customer and service profile data is deployed. Data is cached on Service Engines 2134, Statistics Servers 2140, Call Context servers 2142, Analysis Servers 2144, and other specialized applications or servers 2146 requiring ISP 2100 data.

Service Select 2148 - Whether the services are accessed via a narrowband or broadband network, circuit-switched, packet-switched, or cell-switched, the services are accessed via a Service Select function 2148.

Service Select 2148 is a specialized version of a service engine 2134, designed specifically to choose a service or services to execute.

Resource Managers 2150 - manages all resources, including specialized resources 2152 and service instances running on service engines 2134, and any other kind of resource in the ISP 2100 that needs management and allocation.

Specialized Resources 2152 - Special network-based capabilities (Internet to voice conversion, DTMF-detection, Fax, Voice Recognition, etc) are shown as specialized resources 2152.

Call Context Server 2142 - accepts network event records and service event records in real time, and allows queries against the data. Once all events for a call (or any other kind of network transaction) are generated, the combined event information is delivered en masse to the Revenue Management function 2154. Data is stored short-term.

Statistics Server 2140- accepts statistics events from service engines, performs rollups, and allows queries against the data. Data is stored short-term.

Customer Based Capabilities 2156- software and specialized hardware on the customer premises that enables customer-premises based capabilities, such as ANI screening, Internet access, compression, interactive gaming, videoconferencing, retail access, you name it.

Analysis Services 2144- a special kind of service engine that isn't based on network access, but is based on adding value based upon network statistics or call context information in real time or near real time. Examples include fraud detection and customer traffic statistics.

Other Special Services 2146- entail other specialized forms of applications or servers that may or may not be based on the Service Engine model. These components provide other computing resources and lower-level functional capabilities which may be used in Service delivery, monitoring, or management.

D. ISP Integrated Network Services Figure 22 shows how the ISP architecture 2100 supplies services via different networks. The networks shown include Internet 2160, the public switched telephony network (PSTN) 2162, Metro access rings 2164, and Wireless 2166. Additionally, it is expected that new "switchless" broadband network architectures 2168 and 2170 such as ATM or ISOEthernet may supplant the current PSTN networks 2162.

The architecture accommodates networks other than basic PSTNs 2162 due to the fact that these alternative network models support services which cannot be offered on a basic PSTN, often with an anticipated reduced cost structure. These Networks are depicted logically in Figure 22.

Each of these new networks are envisioned to interoperate with the ISP 2100 in the same way. Calls (or transactions) will originate in a network from a customer service request, the ISP will receive the transaction and provide service by first identifying the customer and forwarding the transaction to a generalized service-engine 2174. The service engine determines what service features are needed and either applies the necessary logic or avails itself of specialized network resources for the needed features.

The ISP 2100 itself is under the control of a series of Resource managers and Administrative and monitoring mechanisms. A single system image is enabled through the concurrent use of a common information base. The information base holds all the Customer, Service, Network and Resource information used or generated by the ISP. Other external applications (from within MCI and in some cases external to MCI) are granted access through gateways, intermediaries, and sometimes directly to the same information base.

In Figure 22, each entity depicts a single logical component of the ISP. Each of these entities is expected to be deployed in multiple instances at multiple sites.

E. ISP Components Ext App 2176- an external application; App 2178- an internal ISP application (such as Fraud Analysis); Dc 2180- Data client, a client to the ISP information base which provides a local data copy; Ds 2182- Data server, one of the master copies of ISP information; Admin 2184- the ISP administrative functions (for configurations, and maintenance); Mon 2186- the ISP monitoring functions (for fault, performance, and accounting); GRM 2188- the global resource management view for selected resources; LRM 2190- the local resource management view for selected resources; SR 2192- the pools of specialized resources (such as video servers, ports, speech recognition); SE 2134- the generalized service engines which execute the desired service logic; and Service Select 2194- the function which selects the service instance (running on a service engine 2134) which should process transactions offered from the networks.